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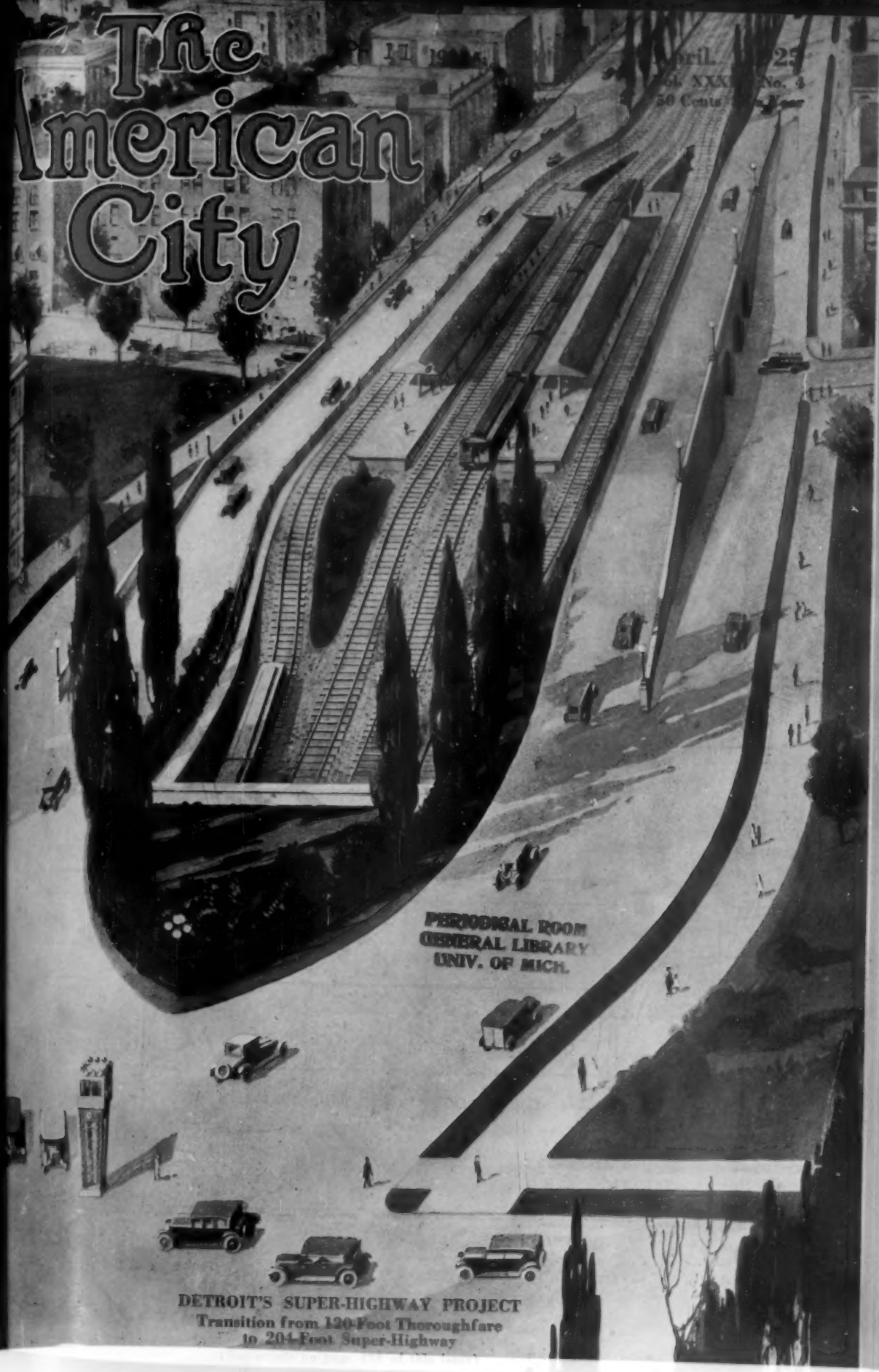

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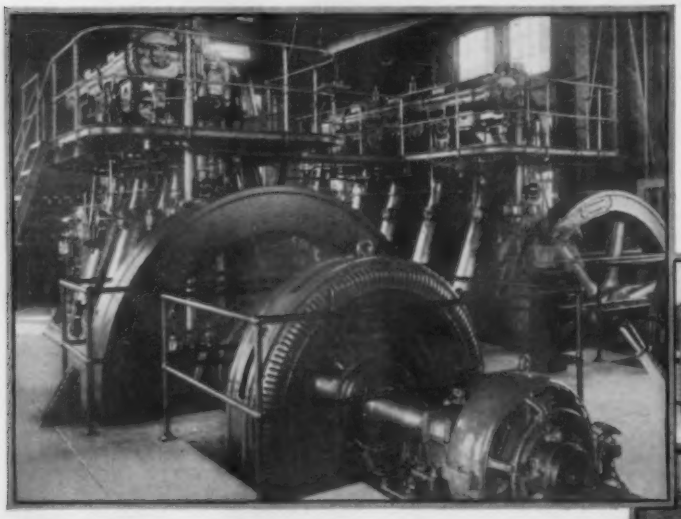
DETROIT'S SUPER-HIGHWAY PROJECT

Transition from 120-Foot Thoroughfare to 204-Foot Super-Highway

FULTON DIESEL



Again Reduces Power Cost at Crowley, Louisiana

Two FULTON DIESELS in the Crowley Power Plant 380 B.H.P. and 285 B.H.P.

The final report of the Central Station, City of Crowley, La., for the year 1924, given below, shows convincing evidence of the profitable operation of a Fulton-Diesel plant in a community of this size.

Ever since Crowley converted its old steam equipment to Fulton-Diesel, annual surplus has taken the place of annual deficits, and insufficient, unreliable service been succeeded by ample provision for the community's growing needs. And all this without a present burdensome investment.

Only as power demands increase need the plant be enlarged. Only the Fulton-Diesel type of power equipment lends itself to such flexibility.

SUMMARY OF ANNUAL REPORTS

	Production Kw. Hours	Total Operating Cost: Maintenance Attendance, Fuel and Lubricating Oil	Cost per Kw. Hour
1923	846,570	$12,328.69	$0.01456
1924	1,089,191	14,395.50	0.01321

	Hours Operation		Average Load Factor		Fuel Oil Gallons	Kw. Hors Per Gallon
	Unit No. 1	Unit No. 2	Unit No. 1	Unit No. 2		
1923	2,115	6,680	.452	.455	88,698	9.54
1924	2,484	6,366	.672	.528	106,883	10.19

Our new Bulletin 807 is now ready. It discusses power plant installations in cities comparable to Crowley. We will gladly send you a copy if you'll ask for it.

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Transition from 120-Foot Thoroughfare to 204-Foot Super-Highway

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No. 4

The American City Magazine

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The Detroit Super-Highway Project

A Unique Departure in Transportation Planning

By Daniel L. Turner

Consulting Engineer, Detroit Rapid Transit Commission

THE Super-Highway is unique. It is a new and necessary departure in transportation planning for the modern city. Not only does it provide for a cheaper form of rapid transit on rails and for the ordinary highway motor-traffic of to-day, but it will also do something never before proposed—it will furnish an express motor traffic highway upon which automobiles can travel continuously at a maximum speed with safety, because all grade-crossing interferences will be eliminated. In other words, the Super-Highway will become the major traffic artery of the future city, for both rail and automobile rapid transit services.

The Super-Highway has been developed in Detroit by the Rapid Transit Commission and its engineering staff, as a result of planning for a rapid transit system on rails. It is fitting that Detroit, the automobile city of the world, should take the lead in making adequate provision for the automobile use of to-day and for the tremendous increase in automobile use that will surely come in the future.

The Super-Highway is an evolution from the Parkway Rapid Transit Line developed by the writer five years or more ago under the auspices of the Transit Construction Commissioner and the Transit Commission in New York, and is first exemplified in a specific project in the Queensboro Parkway Rapid Transit Line proposed early in 1923.

In visualizing the rapid transit requirements for the future, it was recognized that a cheaper method of constructing rapid transit lines must be developed, if adequate facilities for the future were to be had without imposing an inordinate financial burden upon the city. It was found that the permanent way for a surface rapid transit line could be constructed at approximately one-fifth of the cost of a subway permanent way, thereby permitting approximately five miles of surface rapid transit line to be constructed for what it would cost to build one mile of subway in the center of the city, equipment being excluded in both cases.

Main Traffic Arteries Must Provide for Unobstructed High-Speed Movement

The motor traffic feature of the Super-Highway is hardly less important than its rail transit feature. The automobile has been in use only for about a single generation, yet its use has increased at an enormous rate. In 1913 about 1¼ million motor vehicles were registered in the United States; this number had increased to over 15 million in 1923—a gain of 1100 per cent in 10 years. This means that within a decade the automobile has revolutionized street traffic conditions and has created one of the most difficult problems now confronting cities. Consequently, the utilization of every means possible of increasing street and highway capacities has become a matter of paramount importance. Moreover, the automobile is a high-speed vehicle primarily. But under the "stop-and-go" system of operating street traffic, high speeds cannot be obtained with safety. Although the motor vehicle easily permits one to travel at a rate of 30 to 40 miles per hour, where congestion occurs the speed is reduced to 5 or 6 miles. The "stop-and-go" system brings order out of what would otherwise be chaos, and therefore improves conditions and increases capacity to the extent that an orderly

movement is better than a disorderly one, but it also wastes both the capacity of the streets and the usefulness of the automobile. For this reason it is essential that the main traffic arteries of the future should provide for high-speed movement.

High speed on rubber tires cannot be attained any more than on rails unless interferences from intersecting surface traffic are eliminated. Therefore, just as rail rapid transit requires an exclusive right of way, with all grade crossings separated, so all high-speed or express motor traffic, to be safe, must have all grade crossings abolished. The Super-Highway meets these two requirements jointly.

The minimum width for an express motor highway should be sufficient for two express motor traffic lanes and two local lanes in each direction, or eight motor traffic lanes altogether. A minimum of 80 feet will be necessary for these eight lanes. The express and local lanes should be separated by planting strips, at least

opposite points where cross-streets enter the local traffic roadways on each side, so as to prevent the local traffic from immediately reaching the express lanes. This will require 10 feet, 5 feet on each side. Altogether, therefore, for the motor traffic requirements, the Super-Highway must have a minimum roadway width of 90 feet. Adding two 15-foot sidewalks, the total width becomes 120 feet as the minimum width for the accommodation of local and express motor traffic alone. If the 120-foot thoroughfare is split in the middle and the 84-foot right of way necessary for a 4-track rapid transit line is inserted, the combined total width of the Super-Highway of 204 feet is produced. This indicates the evolution of the Super-Highway from the 120-foot subway thoroughfare. The 204-foot Super-Highway will carry its vehicular traffic on each side of its rapid transit facilities; whereas, the 120-foot subway thoroughfare will carry the vehicles above and the trains below. In one case the joint facilities form a single-level street, while in the other case they form a two-level street.

As shown in the accompanying drawing and on the front cover of this issue, all the services utilizing the Super-Highway — local and express motor traffic and local and express rapid transit trains — will operate on one level on the surface between stations. The operation on the express lanes will be continuous. Vehicles will merge and flow along with the traffic stream and finally leave it in the same manner, but will never cross it. Pedestrian and wheel traffic cannot cross the rapid transit or express motor lanes at grade, but may pass under at one-half-mile intersections, and pedestrians may cross at more frequent intervals by means of overhead and underground passageways where conditions warrant such crossings. At stations, located about a half-mile apart, both express motor traffic lanes and rapid transit tracks will be raised sufficiently to pass over the cross-street; thus the rapid transit and express motor service will not be subjected to any crossing interference, which is the end to be attained.

Such a Super-Highway, by reason of the high speeds possible along the express lanes,

Designed by Rapid Transit Commission, Detroit—Daniel L. Turner, Consulting Engineer; John P. Hallihan, Engineer in Charge

204-FOOT SUPER-HIGHWAY CARRYING 4-TRACK RAPID TRANSIT SURFACE RAILWAY
This view shows proposed arrangement at intersecting thoroughfare. For treatment at transition from 120-foot thoroughfare to Super-Highway, see front cover of this issue

will have a much greater capacity than the ordinary "stop-and-go" highway of the same width. It is believed that an express traffic lane operating without traffic interferences is capable of an ultimate development of approximately 7 times the capacity of a "stop-and-go" lane. On this basis the Super-Highway has over 3½ times the capacity of an ordinary "stop-and-go" highway of the same width and with all local lanes.

A Gradual Process with a 225-Mile Goal

In order to utilize the Super-Highway in the interests of Detroit to-day and to-morrow, the Super-Highway system shown on the accompanying plan has been developed. In this last phase of the work, the City Plan Commission and the Road Commissions of Wayne, Oakland, and Macomb Counties have cooperated with the Rapid Transit Commission for the reason that the system traverses not only Detroit, but also those portions of the surrounding counties that will ultimately become a part of the Greater Detroit.

There are 225 miles of Super-Highways in the proposed system, the distribution being as follows:

	Miles	Per Cent
Wayne County	99.9	44.4
Oakland County	40.6	18.0
Macomb County	37.9	16.8
Detroit	46.7	20.8
Total	225.1	100.0

The construction of the Super-Highways will be a gradual process. At the beginning only a portion of the surface will be paved. As traffic increases, the pavements will be widened. Finally, when provision for express traffic becomes desirable, grades will be separated at the station points. So the question of construction is not an urgent one. The important thing first, is to acquire the right of way for the Super-Highways as quickly as possible, before the territory becomes built up. To this end an act has been drafted and is now under consideration by the State Legislature, which will provide the necessary machinery to effectuate the Super-Highway plan.

Civic Center Proposed as Memorial for Boston's Three-Hundredth Anniversary in 1930

BOSTON is already planning for an adequate celebration of its tercentenary in 1930. A Preliminary Survey Committee, of which E. B. Mero is secretary, is at work on the problem, and has submitted its first report to Mayor Curley.

The committee favors a celebration plan by which "the entire year of 1930 shall reflect the anniversary spirit," but with a period of three months ending with the anniversary date, September 17, given over to special events. It is proposed that the permanent Boston Tercentenary Committee shall eventually number 300 members, to be named one hundred at a time at two-year intervals, with provision for state and metropolitan district representation.

Replies to questionnaires of the committee emphasize numerous features which might be included in the eventual plans. A digest of the replies indicates preferences for certain types of features as follows: historical, 109; educational, 97; pageantry, 87; civic welfare, 79; commercial, 79; religious, 69; musical, 68; artistic, 65; home life, 63; athletics, 58; cultural, 58; recreational, 56.

To the question: "Should the celebration result in some permanent achievement, or will a temporary celebration be sufficient?" ninety-six replied in favor of a permanent achievement and thirty-five expressed themselves as satisfied to have a passing observance of the event.

Other features to be included in the plan of celebration, in addition to those named in the questionnaire whose replies are summarized above, were suggested, such as: distinctive street decorations; district celebrations; fireworks; water carnival; daily presentation of significant events with addresses; a worthy monument to the founders of Boston; reproduction of the Boston Tea Party; naval review; aerial exhibition; pageant; significant street parades, etc.

A Boston pageant, says the report, "if undertaken properly and on a large enough scale, should certainly prove to be an important part of the tercentenary celebration . . . and should fully pay its own expenses.

"The proposal has been made and favored by the preliminary survey committee that the preparations for the tercentenary might be so arranged that there would be a series of civic achievements culminating in the main events of 1930. Such a series of civic betterments might include such a comparatively simple but none the less important matter of a policy of shade tree planting on streets; or the development might deal with the accomplishment of the long-delayed adequate recreation service for the whole city.

"The Preliminary Survey Committee believes that the celebration of the Boston tercentenary in 1930 should leave behind it something well worth while, substantial and monumental, and designed for the future advance of the city, in the way of a permanent achievement. Work toward its creation would start considerably in advance.

"This committee believes that, with the proper support and cooperation of the men, women and organizations of Boston and of the metropolitan district, a program could be developed which would provide for the creation of a worthy civic center. Such an undertaking has been talked about for years. The tercentenary offers an appropriate opportunity to crystallize into being this long-desired feature combining both public utility and civic beauty."

The Relation of Form Setting to the Riding Qualities of Concrete Pavements

By C. N. Connor
State Construction Engineer, Raleigh, N. C.

CAREFUL examination of road surfaces by the U. S. Bureau of Public Roads has shown conclusively that it is not the dead weight of motor trucks that destroys the highway. If a loaded truck strikes an obstruction in the road or if the road surface is uneven, the wheel comes down on the road with a thud at every wave or break in the surface. It is this impact that does the destroying, crushing the surface and finally breaking the foundation. A smooth road will eliminate a very large percentage of this impact.

Road forms are a very important factor in the contractor's equipment and should be selected with utmost care because the smooth, even surface required depends almost entirely upon the road rail used. The day when the road contractor could afford to worry along with wooden forms, has passed. High labor and lumber costs, rapidly increasing demand for greater yardage per day, have become important factors in sending lumber forms to the scrap heap. Of equal importance is the fact that good road building cannot be done with lumber forms that slide and bend, thus wasting time and material and making true grading an impossibility. Following the lumber forms came a flood of incorrectly designed and poorly built metal forms, flimsy, too complicated for ordinary laborers to handle with any speed, and with most of the faults that put wooden forms on the retired list. Rails that wouldn't stand up under the pressure of the heavy concrete fill, rails that buckled under the weight of the subgrader and finishing machine, rails with loose parts that are constantly being lost, rails that caught and held concrete, all of these are being thrown out.

I have known of more than one road, built with wood forms, which cost $2.50 or more per square yard for good concrete, whose riding surface is rough and whose life is impaired by impact resulting from this roughness. The difference in cost between the wood forms and the steel forms would not have amounted to more than one cent per square yard.

Contractors are being educated by some highway departments to keep their form equipment in proper condition and up to the requirements, which are in no way unreasonable when the importance of this class of equipment is appreciated. The aggregate may be properly proportioned, mixed, placed and finished, but if the forms are not to line and grade, an unsightly job is the result, with the road surface uneven.

Roads Must Be Smooth to Last

The problems confronting highway departments and road contractors who take pride in the construction of concrete roads and are determined to give the taxpayers roads that are straight, true and smooth, can be solved only in one way, namely, through the use of a reliable steel side form that will stay true and smooth throughout the construction of the road. The form must be light enough to be handled economically and strong enough to stand maximum abuse. A. T. Goldbeck, U. S. Bureau of Public Roads, an authority on concrete road construction, says, "Unevenness of side forms is an inexcusable defect and results in an uneven surface." Increased truck hauling, with the fearful impact developed through the use of flat, solid tires, has made necessary the rigid requirements of state highway departments for an absolutely smooth road.

Types of Steel Forms

Among the first steel forms used were some designated as the "hanging system of steel forms." This system comprised steel stakes made of 1½ x 1½ x ¼ steel angles with a slotted plate riveted to the top. The stake was driven to line and grade and the road rails made of 12-gage steel, with 2-inch top flange and 2-inch bottom flange, suspended from the top of the stake. The only bearing that this form had was the friction of the stakes where they were driven into the ground. This type of form was found to be easily set, as it eliminated the necessity of preparing the base to accommodate the forms. All that was necessary was to drive the stakes to the line and

grade and suspend the rail in position. It was found, however, that it was almost impossible to produce a road free of depressions and waves with this type of form, for soon after the forms were set perfectly to line and grade, the stakes would gradually work into the ground by the manipulation of the hand tap. In some cases, even the manipulation of the heavy screed caused the stakes to sink into the subgrade, which naturally produced waves in the road. Therefore, as early as 1914 it was discovered that it was necessary for the base of the rail to have a bearing on the subgrade substantially the full length of the road.

The wood forms and early types of steel forms did fairly well because the people were so pleased with hard-surfaced roads to ride on that they did not mind the ugliness. It was not long before engineers decided that country roads could be built as smooth as city streets. Finishing machines and new methods of hand finish were devised and the form manufacturers cooperated in putting out better and more substantial steel forms.

Steel Form Specifications

Unfortunately, at the present time there is wide divergence in the specifications of several of the states; some are very lax, while others are very rigid. In some instances the weight of forms is specified; in other instances, weight per foot. Others specify the width of the base, the number of stakes to the rail, and complete details. In the majority of states wood or steel forms are optional and with some variance as to the weight of steel or the thickness of wood. Three states, Nevada, Minnesota and Washington, specify wood forms with no reference to steel forms. It is the practice in Washington to leave the wood form or ribbon in place. Four states definitely prohibit the use of wood forms, namely, Delaware, Maine, Maryland and Virginia.

Fifteen states, in addition to the four previously mentioned, specify steel forms. These are Connecticut, Georgia, Illinois, Indiana, Michigan, Missouri, Nebraska, New Jersey, New Mexico, North Carolina, New York, Ohio, Pennsylvania, Rhode Island, and Vermont. Of these, four mention that wood forms will be allowed on curves, namely, New York, Pennsylvania, Connecticut, and North Carolina. The last two specify on curves less than 150-foot radius.

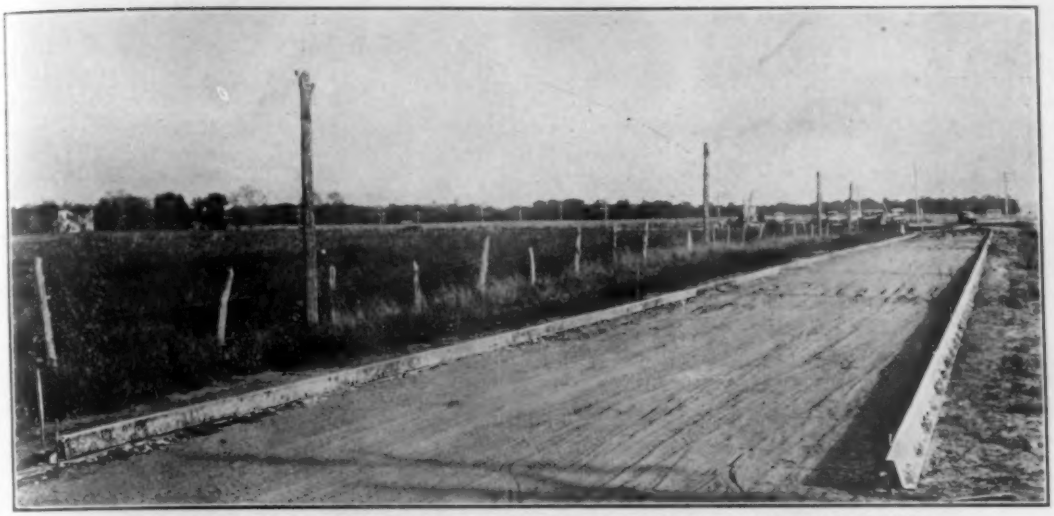
Weight is named in the specifications of eight states; pounds per foot, Delaware, 8; Indiana, 9; Michigan, 10; New Jersey, 7; New York, 6½; North Carolina, 7-10; Pennsylvania, 8-9; Virginia, 8. It is assumed that in other states this question is left to the engineer.

A minimum thickness of 2 inches is allowed for wood forms in 20 states, a minimum of 2¾ inches is allowed in one state, and a minmum of 3 inches is allowed in four states.

Following is an extract from the specifications of North Carolina, which represents average good practice, but still can be improved upon:

Outside forms for this work shall be of metal, of the depth of the concrete, with no horizontal joints, and shall be straight, free from warp and of sufficient strength when staked to resist the pressure of the concrete and finishing machine or finishing tools without springing or settlement. The width of the forms at their base shall be such that the maximum load under any method of finishing shall not be more than seven (7) pounds per square inch on the subgrade. In the event that the subgrade is unusually soft, the use of a finishing machine may be discontinued, and the standard hand finish be substituted. Only approved steel forms shall be used, weighing not less than seven (7) pounds per lineal foot for five (5)-inch forms and not less than eight (8) pounds per lineal foot for six (6)-inch forms and not less than nine (9) pounds per lineal foot for seven (7)-inch forms, and not less than ten (10) pounds per lineal foot for eight (8)-inch forms and not less than eleven (11) pounds per lineal foot for nine (9)-inch forms, exclusive of wedges and pins. The use of wood or steel blocks to secure the required depth of section shall not be permitted. On all projects exceeding three miles in length new metal forms of approved type shall be furnished. Forms that become bent or deformed shall be condemned and immediately removed from the work until satisfactorily repaired and straightened. These forms shall be inspected and accepted by the engineer before being returned to the work. Finished subgrade shall be prepared and forms shall at all times be set and kept true to line and grade at least two hundred (200) feet in advance of the

UNUSUAL CARE BEING TAKEN ON THE SUBGRADE AND FORMS



FORMS IN PLACE AND SUBGRADE PRACTICALLY READY FOR CONCRETING

mixer. Whenever the subgrade is not capable of bearing the weight of forms, finishing machine or finishing tool without settlement, the engineer may require suitable stakes driven to the grade of the bottom of the forms, sufficient in number to give the necessary support. The engineer may, however, require additional bearing area under the forms by securely fastening them to planks secured to the subgrade by the required number of pins. The planks shall be of such width and so fastened that no settlement or displacements occur. The alignment and grade of all forms shall be approved before and immediately prior to the placing of concrete against them. The entire length of the form shall be set directly in contact with the finished subgrade, which shall be compacted by rolling for at least twelve (12) inches on each side of roadway outside the area required for the road metal to rest upon. The building of pedestals of earth or other material upon which to rest the forms in order to bring them up to the required grade will not be permitted. For curves of radius less than one hundred and fifty (150) feet wooden side forms two (2) inches in width and of the depth of the concrete, of well-seasoned surfaced planks, may be used with written permission of the engineer. The length and number of pins shall be increased if necessary, to maintain the forms to correct line and grade, but in no case shall less than three be used to each 10-foot section.

Sufficient forms shall be provided so that it will not be necessary to remove them in less than twelve (12) hours after concrete has been placed or longer, if required. Forms shall be cleaned and oiled before concrete is placed.

Steel road forms should not in general be made of steel lighter than 3/16-inch, regardless of the shape of the rail section. A rail made of material lighter than 3/16-inch will not give as good service and will not survive the rough treatment in use and in handling on the average road job where heavy finishing machines and subgrades are used and the man with the 10-pound sledge is ever present. Delivery of materials by trucks has brought on a new hazard, in that the trucks back over the forms or collide with them in turning on the subgrade, requiring the forms to be well staked at the joints and midway between the joints. At the present time several manufacturers have standardized on 3/16-inch forms and there is a possibility that ¼-inch steel could be used in the manufacture of road forms of great depth, say 12 inches and deeper.

The length of forms at the present time is fairly well standardized on 10 feet for tangents and the majority of curves. Shorter lengths for sharper curvatures are available from most companies. One company has standardized on a 12-foot length with a view to reducing the number of joints and the consequent possibility of an inequality in the pavement opposite the joint.

The height of forms should, of course, be equal to the required depth of the pavement at its edge. It is possible to use a form of greater depth, but extra labor is generally required to get the base down to grade, and the contractors run the risk of laying too great a depth of pavement. If the form is not of sufficient depth, it is possible to support it on planks of metal, but, again, extra labor is involved and the added weight makes handling difficult. The result is that most engineers require full-depth forms.

The base width of a form should be sufficient to carry the weight of all tools or machines, including impact to the subgrade, without settlement. Some newly prepared or moist subgrades will not support more than 1,000 pounds per square foot without settlement. By knowing the weight of a machine, one can readily cal-

culate what load per square inch reaches the subgrade. Particularly after the power machine came into existence, it was extremely necessary that a solid bearing be secured all along the rail, so as to eliminate the possibility of any depression on account of the tamping of the finishing machine, which weighs several tons.

To eliminate all possibility of depression, the base flange of the road rails was increased from 2 inches to 3 inches, and later from 3 inches to 4 inches, and still later from 4 inches to 6 inches, so that at the present time the modern road forms generally used have a base flange of from 4 to 6 inches wide. Some highway departments stipulate that the side forms shall be firmly bedded on the subgrade, so as to eliminate any possibility of depressions. It has been determined by many engineers that the only way to guard against the possibility of depressions or waves in the road surface is to take care of this in the design of the steel forms by eliminating the possibility of suspending the rail above the subgrade, and to compel the setting of forms firmly on the subgrade. Base flanges are now not less than 4 inches wide, with a 6-inch base for extremely sandy or loamy subgrades. The top flange is not less than 1½ inches or more than 2½ inches wide, preferably 2 inches wide, according to most specifications. The width on the top of most forms now on the market is about 2 inches. This is unnecessary and perhaps dangerous. The top width should only be sufficient to carry the finishing machinery or tool, but the depth of the top should be ample to develop the web strength. A desirable steel road form must be designed so that it is not only straight and true, but also able to withstand the rough handling to which such a piece of apparatus is subject.

Joints in the forms should be so designed as to connect the abutting ends of the rail neatly and securely so that there will be no sagging. Stakes should be inserted as close as possible to the rail joints. Regardless of the strength of the form itself, if the connecting device is weak, the entire system cannot be depended upon. Joints between sections on the two sides must not be opposite, but should be staggered whenever possible.

One of the first requirements of a satisfactory staking system for road forms is to prevent the forms from overturning, settling or changing alignment. In view of the rigid requirements for a smooth road, which means that there cannot be any break in the grade line, the staking system must perform a second or double function of preventing the forms from sagging or settling, either at the joint or along its length. There should be not less than three stake pockets to a 10- to 12-foot section, preferably an extra stake pocket for emergency purposes, or four stake pockets per section. Two pockets should be located as close as possible to the rail joint, as the joint is the weakest part in the line of form. If the joints are not held securely, the alignment of the form is not secure and depressions at the joint will cause waves in the finished road surface. The length of pin will depend on the firmness of the subgrade into which they are driven. The softer the subgrade, the longer the pin. The connections and braces vary widely. Some designs use none at all, others depend on stiffness and comparatively thin metal for the body of the form, while others use the thicker metal and braces. It is my opinion that the best form, and one which road builders may come to later, is a structural section of medium steel which will resist impact better than the softer section now in general use.

The number of forms required depends entirely upon the speed with which the concrete is poured and the specifications under which the work is done. Specifications require that forms shall set to line and grade from 200 to 500 feet in advance of the point of placing the concrete, the average being 300 feet. Thus, as the average day's run of concrete is 500 feet and the forms must be left in place for at least 24 hours, about 2,000 feet of forms are usually required for each paver. The amount required, however, depends on the locality and varies from 1,000 to 3,000 feet. When the forms have been selected and arrive at the job, the contractor should look them over carefully and condemn those that are in any way defective, in much the same manner as he does his other equipment. Many contractors seem to feel that the forms are a part of the engineer's equipment and that if the inspector accepts them his worries are over. He should realize that the cost of good form setting is one of his heavy items and it costs very much more to set and handle poor forms than it does good ones. If wood forms are warped or if steel forms are bent so that there is a variation of over 1/16-inch in 10 feet, they are not suitable for use. If the top varies, the variations will make an irregular surface.

ACKNOWLEDGMENT.—From a paper read before the American Road Builders' Association at Chicago.

BIRD'S-EYE VIEW OF THE CAMDEN OF THE FUTURE

Boulevard, Civic Center and Park Planning Accomplishments in Camden

By Charles Wellford Leavitt
Civil and Landscape Engineer

OWING to its proximity to Philadelphia, Camden, N. J., like many another city near a greater center, has been regarded for a long time as a satellite city, its own claim to worth being overcast by the glamor of the more wealthy metropolis near-by. This Cinderella existence is about over, and it remains for Camden to assume proper attire for the full enjoyment of the next phase of her life. In 1926 there will be open to the public the Philadelphia-Camden Bridge over the Delaware, necessitating on the part of Camden not only the preparation of roads, approaches, plazas, etc., but also a rearrangement of important street thoroughfares in the more crowded portions of the city, and suitable provision, by means of open parkways and river-front recreation spaces, for the outdoor relaxation of the citizens.

The New Jersey State Highway Department has carefully studied the problems connected with the increased volume of traffic which the southern portion of the state, as well as Atlantic City and the north, will send to Camden by reason of the opening of the bridge, and has reached a solution deserving of country-wide attention for its simplicity and efficiency.

By-Passing Through-Traffic Around the City

The bridge will provide the principal means of ingress and egress westward—the common focus of three trunk-line highways entering Camden from the north, east and south respectively. In order to provide sufficient and safe accommodation for traffic which will come over these highways, and in order to make such provision without the staggering expense entailed by the destructive cutting of new highways through developed property within the city limits, the "Crescent Boulevard" is planned. This highway will be so aligned as to connect with the three entering highways and will lead the traffic from them around the city to a point just outside the city limits where, over lands heretofore undeveloped, another highway, the "Bridge Boulevard," will start and extend to the bridge.

It is estimated that this scheme will avoid the destruction of existing values to the extent of many millions of dollars. It also will create new ratables, incalculable at this time, and will prevent undue congestion in the city streets.

The Bridge Boulevard is planned to be 120 feet over-all, with a paved roadway 78 feet wide, providing with reasonable clearance for eight lines of vehicles, four in each direction. On this boulevard, in order to maintain streams of traffic with the least possible interruption, street crossing will be avoided where possible,

COOPER RIVER PARKWAY, CAMDEN, BEFORE IMPROVEMENT

VIEW OF PROPOSED IMPROVEMENT

and heavy-traffic artery crossways will be accomplished by grade separation.

Civic Center Tract Secured

No city grows without public buildings. The more beautiful such public buildings are, and the more esthetically grouped, so much greater is the civic pride of the generations of citizens supporting them. Camden, besides being an industrial city of over 120,000 population, is the county-seat of Camden County. Fast on the heels of the further growth of the city will come the increase of the importance of the county; and the county, as well as the city, will need proper housing for its official functioning. The dictate of wisdom was the selection and acquisition of property for a centrally located and spacious civic center to accommodate the buildings of the city and county governments.

The creation of a civic center in an existing city of the size and activity of Camden is usually accompanied by such difficulties as excess condemnation, legal proceedings, enormous expenditures of taxpayers' money and hazardous contingencies of like nature. Especially is this true if it is desired—and it always is desirable—for the city to control the building activities of the property adjacent. To Camden these difficulties are, and will be for all time, non-existent. For a reasonable sum, at private sale, there has been purchased a tract well located and somewhat larger than might be considered necessary for the actual public buildings. This tract is on the Cooper River, within comfortable distance from the Bridge Plaza, and will form a portion of the Cooper River Parkway. It provides an imposing setting for the civic center and will turn a present unoccupied and uncared-for stretch of land into a useful and beautiful public possession.

The Cooper River Parkway

To all lovers of landscape, Bronx Parkway, in New York, and Fairmount Parkway, in Philadelphia, are sources of great pleasure and satisfaction. Their transformation of seemingly waste land into accessible recreation grounds of esthetically valuable character has been the cause of gratification and congratulation on all sides. The Cooper River Parkway, planned to extend from the site of the civic center in Camden along the Cooper River twelve miles or more back into the country, will give to Camden and her suburbs a happy and charming development of the same nature as the Bronx and Fairmount Parkways. Haddonfield, Collingswood, Westmount and the vil-

COOPER RIVER PARKWAY, HADDONFIELD, BEFORE IMPROVEMENT

VIEW OF PROPOSED IMPROVEMENT

lages in Delaware and Pensauken townships will be connected with the Camden civic center by pleasant drives through the country forever secured in its beauty and guarded against deforestation and ravaging clearance.

It was found that a number of property owners whose lands come partially within the lines of the Cooper River Parkway as tentatively planned, were willing, for the sake of realizing the parkway, to give property outright or for a nominal price. In order to take advantage of these donations and nominal price sales, it was necessary to have some organization to take over and hold title to property and other assets until such time as Camden County may have a legally appointed park commission empowered to function. For this purpose, there was held a meeting of representative people of the county, the result of which was the formation of the Camden County Park Association. This Association now is acting as an interim trustee until such time as the county park commission is created, when there will be turned over to the commission all property and unexpended cash in the Association's possession.

The financial strength of a nation, for the ordinary humdrum life of this every-day world, can be calculated largely on paper in dollars and cents. So, perhaps, it is fitting to mention here the financial value to a city and its suburbs of the creation of new and highly desirable ratables due to the improvement and beautification of a wide and long strip of country. All the property in its vicinity will benefit, and tax receipts will rise accordingly. But that is not the real strength of a community, that money factor, as has been shown only too sharply to us of this generation. In those periods of crisis which come to nations, as to individuals, it is not financial standings which are most important to their worthy acquitting of themselves. The moral, mental and physical fiber and sinew of a people are weighed in the balance in time of stress—those characteristics which are the result of education, proper influences, proper thought, and sufficient recreation to permit such thought, familiarity with outdoor sports under pleasing and lawful conditions; in fact, all the features which aid in the development of the individual into a well-rounded citizen of a civilized social community. And so the value of well-kept civic possessions and of the plentiful creation of parks and playgrounds is an item which seems almost incapable of exaggeration. It is a topic upon which volumes have been written, and upon which there is still much to be said, rightfully so, until in all our crowded indus-

COOPER RIVER PARKWAY, PENSAUKEN TOWNSHIP, BEFORE IMPROVEMENT

VIEW OF PROPOSED IMPROVEMENT

COOPER RIVER PARKWAY, WESTMOUNT, BEFORE IMPROVEMENT

VIEW OF PROPOSED IMPROVEMENT

MAJOR THOROUGHFARE PLAN FOR CAMDEN, SHOWING LOCATION OF CIVIC CENTER

trial centers such as Camden the people have access to such parkways as are planned in western New Jersey along the Cooper River from Camden to Haddonfield.

On Discouraging Over-Population of a City or State

"CONSIDERABLE discussion was aroused by a statement in the last Chamber of Commerce bulletin to the effect that our rapidly increasing population should not be over-stimulated until adequate measures have been taken to provide for increase . . . .

"Berkeley to-day is growing fast enough. Let us bend our energies to supply schools and playgrounds, parks and boulevards, enlarge our library, start a civic center, improve our traffic conditions and street paving, improve our street lighting, build larger and better stores in the heart of the city, provide a first-class modern theater, another fine, modern hotel, maintain our symphony orchestra, start an art gallery and a museum of natural history, and indeed provide those things which will make us stand out in the eyes of the world as a really enlightened and superior community. The right kind of people will want to live in such a place and will come here automatically, just as fast as we make provision for them.

"Indeed, they are coming here to-day at the rate of 6,000 a year on account of our educational advantages and the charm of our homes. We do not need to attract them with sign-boards by the country roadside. That may do for country villages, but disfiguring the landscape never appeals to people of taste and discrimination. When Sarah Bernhardt played Phaedre in the Greek Theatre she gave Berkeley more favorable advertising than ten thousand sign-boards could give. Money spent in supporting a symphony orchestra would yield better returns to the merchant in community advertising than any flaring posters or signs.

"Not only should the increase of city population not be stimulated beyond the provision for caring for a high-grade type of city, but there are even limitations which should not be overlooked in regard to state increase in population. The development of water conservation to supply water for irrigation, for industrial and domestic use, is one of the leading factors in determining future population. The available supply of water for all these uses in the year or succession of years of greatest drought, and the number of people which this water can adequately serve, will always be a limit of reasonable and proper expansion. Beyond this will be congestion and misery in the place of prosperity and contentment. And this water-supply and its proper conservation are largely determined by the forests which are being so rapidly destroyed."

—From the January, 1925, Report of the Chamber of Commerce of Berkeley, Calif., to Its Members.

Dust Elimination on Gravel Roads

By B. C. Tiney

Maintenance Engineer, State Highway Department of Michigan

MICHIGAN is maintaining a trunk-line highway system of approximately 6,500 miles, of which 3,400 miles are surfaced with gravel. In addition to this, we have, in the secondary system of state-rewarded county and township roads, about 7,400 miles of gravel surfaces, making a total of 10,800 miles of this type in the state. Traffic on these roads ranges from about 200 to 2,000 vehicles per day. A traffic census on the trunk-line system indicates the density of traffic on the 3,400 miles of gravel sections as follows:

A SURFACE-TREATED GRAVEL ROAD NEAR ANN ARBOR, MICH.

Miles	Average Daily Traffic
1,680	Less than 500
1,280	500 to 1,000
240	1,000 to 1,500
200	More than 1,500

Complete traffic data are not available for the gravel roads of the secondary system, but it is estimated that a large majority of them have a daily traffic ranging up to 500.

This large mileage of gravel road presents a serious problem in the elimination or reduction of dust. Dust control is desirable on roads carrying a daily traffic of 300 to 500, and we have come to regard it as almost a necessity for traffic of more than 500.

Our practice in this work has been along two distinct lines: first, the application of dust palliatives which afford a temporary reduction of dust; second, the application of bituminous surface treatments which afford a complete elimination of dust.

Dust Palliatives

As dust palliatives, the two types of material in use are calcium chloride and light asphaltic oil. In our experience the first essential to the successful use of either of these materials is that the surface of the road, prior to application, shall be covered with ½- to 1-inch of loose gravel uniformly distributed. This loose cover ranges in size up to ½- or ¾-inch, and is floated back and forth daily by patrol graders or drags, keeping all depressions filled. The smooth-riding quality of the road, with or without dust palliatives, depends upon preserving this floating cover. We have found that any attempt to apply calcium chloride or light oil in sufficiently large quantities to eliminate all dust will result in the solidifying of the loose gravel under traffic. This forms a surface crust upon which the patrol graders have little or no effect, and which, under traffic, soon develops into holes. In such cases it is necessary to scarify the surface in order to restore its smoothness.

If dust palliatives are applied more frequently but in smaller quanities per square yard, they may be made to reduce the dust to such a degree that it is not objectionable to traffic, and at the same time will not mat the surface or injure its riding qualities. The preparation of a surface for application of calcium chloride or oil involves the supplying of cover on bare sections, either by light scarifying or resurfacing.

Calcium Chloride

Michigan uses calcium chloride conforming to the A.S.T.M. Specification D98-22T, which permits either the flake or granulated form in particles up to ⅜-inch in size. It is delivered in air-tight metal drums of 375 pounds each or in weather-proof sacks of 100 pounds each. The sacks are preferred for ease in handling, but if the material is to be stored for some time before application, the drums are more satisfactory.

The quantities recommended for application on roads having ½- to 1-inch of loose gravel

on the surface are: first application, 1 pound per square yard; second application, ½-pound per square yard. For fairly heavy traffic, a third application of ½-pound per square yard is usually required. These applications are made at intervals of four to six weeks, and the total of two pounds per square yard is generally ample for the season.

Local conditions sometimes warrant a variation from these quantities. A new road, not thoroughly bonded, will require a heavier application, as much of the calcium chloride is absorbed into the body of the road, where it aids in consolidating the gravel. Roads that have been treated for two or three years retain some of the effects of the previous treatments, and in a number of such cases we have found that two or sometimes three applications of ½-pound each are sufficient for a season's work. The effect of a treatment may be considerably lessened by a heavy rain, within a period of ten hours after application, which tends to wash a great deal of the material to the sides of the road.

Calcium chloride not only reduces the dust but conserves the gravel on the road. We find that roads constructed from gravel with a sand filler are very difficult to hold intact under traffic in dry weather, and this is especially true if the road is built on a sandy subgrade. On these sections, calcium chloride is of particular benefit, not only as a dust palliative, but as a bonding agent to prevent raveling of the metal.

The work of application requires no elaborate equipment. A supply of the material carried on a truck is fed into a lime-drill coupled closely behind the truck or into a cheaply constructed wooden hopper attached to the rear of the truck-body. Such a unit of equipment is capable of covering from 5 to 10 miles of road per day.

The cost of calcium chloride applied is 2¾ to 3 cents per square yard, or about $300 per mile for a full season's treatment of 2 pounds per square yard. This cost is materially lessened in some sections of the state where by reason of lighter traffic or other local causes a total of 1 or 1½ pounds per square yard is sufficient.

In some of the northern counties where the heavy traffic season is shorter, the application is made to a width of only 8 feet. This treatment is further distributed toward the edges of the road by patrol graders and traffic, and gives satisfactory service at a cost of about $125 per mile per year.

Asphaltic Oil

Light asphaltic oil has been used to a somewhat limited extent as a dust palliative in Michigan during the last few years. Experimental work with oils of different densities led to the adoption in 1923 of the following specification, which provides an oil of about 35 to 45 per cent asphaltic base:

MICHIGAN OADP
Specification for Asphaltic Oil
for Use as a
Dust Palliative on Gravel Roads
(Cold Application)

The asphaltic oil shall be homogeneous, free from water, and shall meet the following requirements:

(a) Specific gravity, 25°/25°C. (77°/77°F.) not less than 0.900
(b) Flash point, not less than ..... 80°C. (176°F.)
(c) Specific viscosity (Engler, 50cc. at 25°C.) ... 15 to 30
(d) Loss on heating at 163°C, 20 gm. 5 hrs. not over 30%
(e) Total bitumen, not less than 99.8%

The oil is applied with a pressure distributor to the road surface, which has been prepared as previously described. The first application consists of 1/5-gallon per square yard, which is followed after an interval of about six weeks with a second application of ⅛-gallon per square yard. These quantities are intended for roads having a floating cover of ½- to 1-inch of gravel. On such roads, the two applications have been found to reduce the dust quite satisfactorily for the season, without matting the surface. The average cost of this work is as follows:

	Per Gallon
Oil, delivered	$0.0675
Application	0.0175
Cost, applied	$ 0.085

This gives a cost of $0.028 per square yard, or about $300 per mile for a full season's treatment. A 20-mile section in the northern part of the state was rendered fairly dustless during the past season by one application to a width of 16 feet at a cost of $160 per mile.

It has been demonstrated in the last year that light oil treatments can be made to compare favorably with calcium chloride treatments, both in cost and results obtained, provided careful attention is given to the details of the work.

Bituminous Surface Treatments

A further solution of the dust problem lies in the bituminous surface treatment of gravel roads. Our practice in conducting this work is very similar to that involved in the surface treatment of water-bound macadam. These treatments cannot be successfully applied to all types of gravel roads and should be attempted mainly on those containing a high percentage of stone, thoroughly compacted.

The nearer this approaches a macadam in structure, the better will be the results of treatment. Full thickness of metal and proper drainage are important factors.

Preparation of Surface.—As soon as the ground is free from frost in the spring, the road is shaped with a grader and, if necessary, scarified lightly to eliminate all ruts and holes. Traffic is then allowed to compact the loose material, and a true cross-section is maintained by intensive patrol work for a period of a couple of weeks, or until such time as weather conditions are suitable for applying the treatment. When treated, the surface should be fairly dry, but the main body of the gravel may contain considerable moisture. In fact, some of our best results have been obtained with treatments placed early in the season before the gravel had lost moisture to the extent that it began to disintegrate under traffic.

Immediately prior to treatment, the surface is thoroughly swept with a rotary broom, removing all loose material and exposing the larger stone until they project slightly. Special attention should be given to thoroughly cleaning the edges of the metal, using hand brooms if necessary. It is our practice to apply the treatment one foot wider on each side than the originally constructed width of the gravel. If detours are available, it is advisable to close the road to traffic from the time of sweeping until the completion of treatment, and, if convenient, for 48 hours after treatment to allow the bituminous material to obtain an initial hardening. This latter practice is recommended for the reason that it lessens the objection of the public to driving over a newly treated road.

Application of Treatment.—Bituminous material is then applied by a pressure distributor of such type as to insure uniform application and proper control of quantities. The first application, or prime coat, is made at the rate of 0.2-gallon per square yard and allowed to penetrate for at least 24 hours before making the second application.

The second application is made at the rate of 0.3-gallon per square yard and is followed immediately with a covering of stone or slag chips or pea gravel at the rate of 12 to 18 pounds per square yard. Best results have been obtained by using a covering material up to ½-inch in size with the dust removed. This is usually spread directly from a truck by opening the rear gate slightly, or by patented spreading devices attached to trucks.

The bituminous materials that we have used in this work have been mainly tars, although we have placed some treatments with asphalt. The tars used conform to the A.S.T.M. Specifications D104-23T for high-carbon tar and D105-23T for low-carbon tar. Our experience has led to no decided preference in the use of high- or low-carbon tar, as we have obtained equally good results with both types. The asphalt used conforms to the Specification OC-2, published in Bulletin 691 of the Bureau of Public Roads. This is a very volatile material, having a flash point of not more than 122°F.

The foregoing specifications for both tar and asphalt provide materials which may be applied without heating. We have found it to advantage in some cases, when applying them in cool weather, to heat the materials to about 115°F., as they distribute more readily and uniformly.

Subsequent Hand-Patching.—Patrol patching following the treatment is very necessary. Small breaks in the surface must be patched soon after their appearance. For this purpose, a mixture of coarse sand with the same bituminous material used in the surface treatment is employed. This mixture is made in the ratio of 14 to 17 gallons of bituminous material to 1 cubic yard of sand. A lean mixture is desirable, and the mix should be so adjusted as to give a complete coating of particles with no free bitumen. This work is best handled by using a small concrete mixer at a central yard and stocking the mixture in small piles on the road shoulders. One man with wheelbarrow, broom and shovel can patrol 8 or 10 miles of road, although it may be necessary to supplement his efforts with a gang and a truck for a day occasionally. The surface breaks are filled with the mixture, which compacts readily under traffic.

If the first year's treatment is in fair condition the following spring, it is patched where necessary and given another treatment of about ⅓-gallon per square yard. Subsequent treatments are generally made at the rate of ¼-gallon per square yard.

The necessity of treating every year depends upon the traffic and local conditions. We have some sections which have been given three treatments in five years and one section which has had two treatments in four years. Average conditions would probably require three treatments in four years. In the northern part of the state where snow is not removed for wheel traffic throughout the winter, these treated surfaces are generally found to be in good condition in the spring,

because wheels with non-skid devices are not traveling on the bare surface when it is cold and brittle. In the southern part of the state this severe winter traffic, together with excessive frost-heaving, has broken up some sections to the extent that an entirely new treatment was necessary the second year. In such cases the unbroken portions of the old mat should be removed by scarifying at the time when the frost is leaving the ground. We have found that if they are left until later, it is very difficult to scarify them. The old mat becomes thoroughly broken up under traffic and patrol graders, and the surface is again treated in the same manner as in the first year.

The average cost of a first-year treatment is about $1,000 per mile with about $200 additional for patch work. Unless it is found necessary to remove the old mat, the subsequent treatments will cost about $200 per mile less. On a basis of three treatments in four years, we have an average cost of $850 per mile per year. This appears to be economical maintenance for roads carrying a daily traffic of 800 or more. We find that roads with a traffic of 800, which are maintained by the use of patrol graders, with the necessary resurfacing and dust palliatives, are costing an average of $600 to $700 per mile per year. On some of the heavier-traffic roads the cost of this loose-surface type of maintenance would equal or exceed that of the treated-surface type.

ACKNOWLEDGMENT.—From a paper read before the American Road Builders' Association, at Chicago, January, 1925.

Making the Municipal Power-Plant Profitable

By Delbert Kay

THIS is an important problem which confronts many municipaliites. An ample supply of dependable power furnished at low rates is a valuable asset to any community. Cheap and reliable service not only means a well-lighted city, but serves to bring in new and growing industries which require power and light for their manufacturing operations. Such new industries provide additional employment which materially stimulates city growth and means added business for the local mercantile enterprises.

There are many municipalities handicapped with an unreliable power supply, or where the rates are prohibitive of an extensive use of the service. Municipally owned plants are frequently seen in which an endeavor is made to render service from obsolete equipment that has long outlived its usefulness, and is not efficient or suitable for present-day conditions. It is a safe assumption that if it were generally known at what cost power was being produced, such conditions would not be tolerated. Such plants drift along year after year, perhaps rendering a fair degree of service, but on an unprofitable basis. Often the receipts for current sold barely offset the expenditures for fuel, labor and maintenance. No surplus is laid aside to take care of future extensions or replacements. A plant of this kind would not be considered a profitable private investment; then why should it be considered profitable for the municipality?

Of the various municipally owned utilities, the water system far predominates, as it is generally believed that this service can be best and more cheaply provided by the city-owned plant. If this is true, why cannot electric service be provided in a similar manner? There is nothing mysterious about the generation of power. An installation of efficient power units, properly maintained and supervised, will produce current as cheaply for the city as for private interests. It is essential, however, that the management be free from local political strife and not be made a football by those trying to further their political interests. The best-equipped plant will be a failure under such unfortunate conditions.

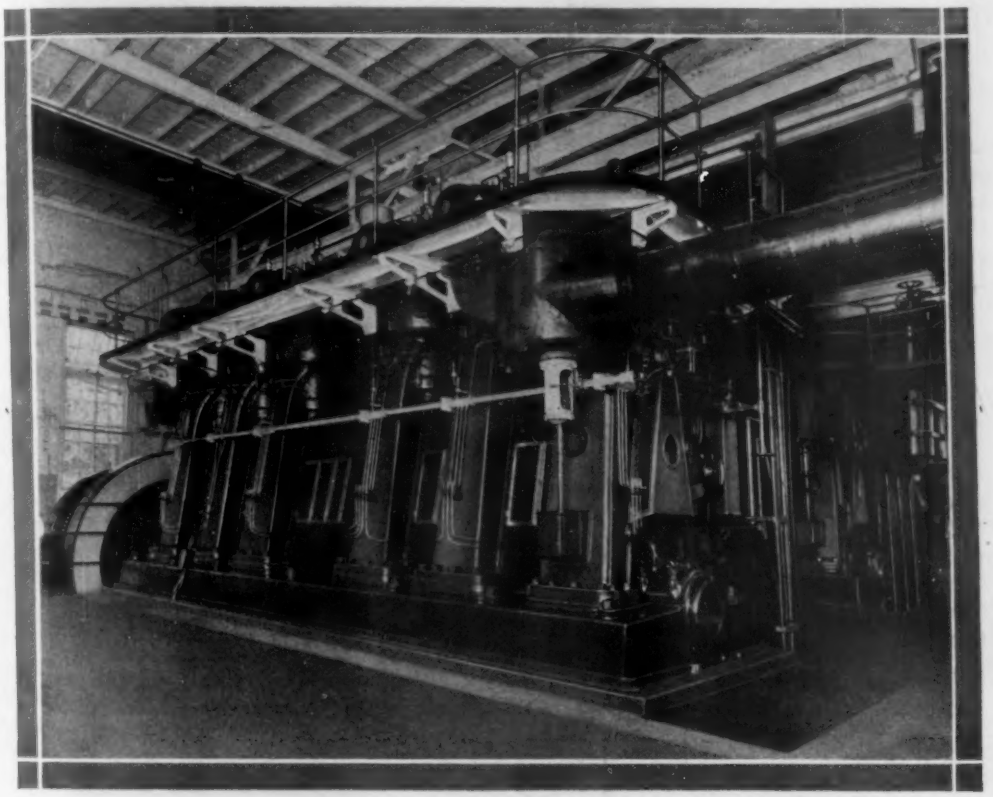
There is much clamor emanating from various sources against municipal ownership of utilities. Frequently a plant is pointed to as a glowing example of inefficiency, but if an investigation is made it will usually be found that the plant is equipped with antiquated generating units and as a result the cost of power production is naturally high. In such cases comparisons are not made with modern plants equipped with up-to-date power units.

One frequently hears of municipal plants

being abandoned in favor of purchased current. Is this, however, a solution of the problem? Does the central station offer anything in the way of better service or lower rates that cannot be obtained from the modern city-owned plant? Where a change is made to purchased current, it is seldom that the rates are lowered. A domestic lighting rate of from 4½ to 7 cents and a power rate from 1 to 2½ cents are not uncommon with properly equipped municipal plants in which current is being derived from fuel. Central stations in the same localities are not offering service at such low rates.

When it comes to the question of dependable service, can the central station offer anything better than a good municipal plant can furnish? Where current is brought in from a long distance over transmission lines subject to severe weather conditions, interruptions cannot be guaranteed against. Where severe storms are prevalent, especially if accompanied by sleet, shut-downs are common. Such instances may prove serious if the water-supply is dependent upon electric service. This is never a problem to contend with when the power is produced locally.

The success of the modern city-owned plant is best evidenced by the results that are being obtained with respect to low rates and satisfactory service. There are many cities that have long provided their own electric service, and the power-plant is now considered a civic necessity. Often, however, these plants have passed through stormy careers during their early existence and have met with stubborn resistance from those opposed to any form of municipal ownership. Their attainment has been largely through the untiring efforts of certain individuals who are endeavoring to improve civic affairs, often at a loss of personal time and the sacrifice of private business.



INTERIOR OF CARTHAGE, MO., DIESEL INSTALLATION IN MUNICIPAL POWER-PLANT

Experience at Carthage

An example of a plant that has had a varied and interesting career can be found at Carthage, Mo. As in many other cities, the power-plant is the outgrowth of the water system. In 1881 a franchise was granted to

COMPARISONS OF STEAM AND DIESEL PLANTS

		Fuel	Labor	Supplies	Repairs	Total Cost Per Year	Receipts Per Year	Profit or Loss (Loss)	Kv.-Hrs. Developed	Cost Per Kv.-Hr.
Steam,	1920...	$41,113.92	$5,100.00	$2,054.25	$931.70	$49,199.87	$49,142.49	$57.38	2,339,485	$0.0210
Diesel,	1923...	12,836.34	5,469.05	2,585.16	1,813.85	22,704.40	71,080.25	48,375.85	2,823,350	0.0080

private interests for the building of a water system. Considerable strife followed because of unsatisfactory service and high rates, which eventually led to expensive litigation when the city again tried to get control and operate it as a municipal plant. This was eventually accomplished, but not until considerable experience was had with the methods employed by the owners, who were more concerned with financial returns to the stockholders than with service rendered. The water system was later combined with the light plant and both placed under the same management.

For a number of years the municipal powerplant served faithfully, but in later years it could not be considered profitable. As the price of coal advanced, the inefficiency of the steam units became more apparent and it was evident that something would have to be done if the city were to continue to provide this utility. Careful investigation was made as to what type of unit was best adapted for the service, one that was absolutely dependable and could produce power at a price that would place the unprofitable plant on a paying basis and still permit the sale of current at low rates.

It was decided eventually to abandon the old steam plant and install diesel engines instead, which would materially improve efficiency and eliminate the loss at which the plant was then operating. In 1921, a 750-horse-power Nordberg two-cycle diesel engine, direct-connected to a 500-kw. generator, was purchased. This unit had sufficient capacity to handle the ordinary load, but during the peak periods it was necessary to operate one of the steam units. With this method of operation it was necessary to keep the steam plant in service, which was continued until 1924, when a second diesel engine of similar make was purchased but of 1,250 horse-power size, connected to a 1,100-kv.-amp. generator. With this second unit in service, it was possible to discontinue the steam plant entirely.

Comparative costs of power produced by the steam and diesel plants are interesting and show what can be accomplished with the diesel engine when used for replacing inefficient steam equipment. In 1920, the last year in which service was produced entirely by the steam plant, the lighting plant showed a loss of $57.38. The power costs included fuel, labor, supplies and maintenance, but did not include fixed charges. In 1923 the major portion of the service was produced by the diesel engine, which showed a profit of $48,375.85 from the diesel unit only, based on the same cost items. The comparative figures for the two types of plants are shown in the accompanying table.

While it is claimed by some that the diesel engine is not dependable and the maintenance costs are high, it must be remembered that for almost three years the service in Carthage was dependent upon the 750-horse-power engine. It was kept in continuous operation week in and week out, being shut down for a few hours each Sunday for the purpose of making a casual inspection. During January, 1924, it was in service 733 out of the 744 hours, or 98.5 per cent of the time. While such long-service periods are not ordinarily recommended, it shows what can be expected in the way of dependability with these perfected power units.

With both the 750- and the 1,250-horse-power engine now in operation, still greater profits can be expected. What was once a money-losing venture can now be considered a profitable investment. Carthage can well be proud of its modern plant, which provides dependable service at low rates and still shows a handsome profit to be laid aside for future extensions as may be required.

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Forward Steps in City and County

A Unique Solution of a Difficult Traffic Problem

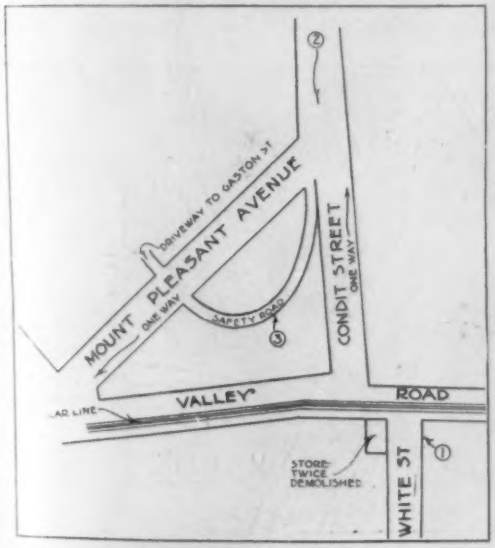
WEST ORANGE, N. J.—To meet a menacing traffic condition which had resulted in four serious accidents at an irregular street intersection at the foot of a hill during a period of less than two years, the Commissioners of this town recently adopted the unique plan of building a special "safety road." Two runaway trucks and two runaway busses, whose drivers had lost control, had met with disaster at the foot of the hill, two of these vehicles having crashed through a large grocery store, and the other two having overturned with loss of life and injury to the passengers.

In attempting to devise some remedy for this menacing condition, the Commissioners of the town received many suggestions, such as bumpers with coiled springs behind them, like those seen in railroad terminals; wire cables stretched across the road with heavy coiled springs at either end to take up the recoil; and sand-beds in the road varying in depth from a few inches to over a foot. It was finally decided to reject all of these suggestions.

The Director of Public Works and two citizens, J. B. McArdle and Theodore D. Faulks, then conceived the idea of constructing a safety road in the form of a loop at the foot of the hill in Memorial Park. This park is but slightly off the direct line of the straight road—the route which has led runaway machines into a busy artery of traffic with double trolley tracks and three bus lines thereon. An added danger of the straight-road route is the practical certainty of a runaway's crashing into the building at the foot of the hill.

The safety road as constructed in the park has a radius of approximately 175 feet. It is 12 feet wide, built of 1½-inch trap rock, with a heavy bluestone curbing as a header on the outer edge of the curve. The superelevation of the outer curve is 6 inches. It is figured that this will be sufficient, because of the looseness of the stones in the roadway creating additional friction to reduce the momentum of runaways. The superelevation will tend to keep the four wheels of the runaways on the road, and we believe will guide them around the loop.

We have provided a further safeguard, should a car still retain a high rate of speed after negotiating the safety road. This consists of a driveway at the end of the curve having an up grade sufficient, it is believed, to stop any car.



MAP SHOWING THE POINTS FROM WHICH THE THREE PHOTOGRAPHS WERE TAKEN

REMEDYING A DANGEROUS CONDITION

1. Dead end at foot of hill. Store window at left has been demolished twice by runaway trucks. 2. Approach to "safety road." Entrance is directly under arc light, between the two large trees. 3. Section of safety road, showing embankment on outside of curve

A sign, illuminated at night, containing the laconic legend, "Control Lost, Enter Park," is to be hung across the road 100 yards up the hill, and this we think is so short and terse that he who flies may read. We hope that there will never be any occasion to take advantage of this road, but that if such an occasion should arise the road will prove to accomplish all that its sponsors intended.

FRANK A. O'CONNOR,
Commissioner of Public Works, West Orange, N. J.

"Stop," "Walk" and "Go" Signals on West Chicago Park Boulevards

WEST CHICAGO, ILL.—Work is under way to provide the West Side of Chicago with automatic traffic controls at every intersection of a boulevard with a street-car line or another boulevard. Park forces have already installed the new signals at 31 intersections, and other installations will be made in the near future.

The signals now being installed, which are of the Essco type, show three different legends—"Stop," "Walk" and "Go"—one above the other, with a red bull's-eye mounted on the top to signify a traffic change. "Stop" is shown in red, "Walk" in amber, and "Go" in green. The letters are 5 inches high, and the "Stop" and "Go" are lighted from within by the use of 200-watt lights, proper distribution of light being obtained by refracting glass, so as to afford a satisfactory visibility. "Walk" is also lighted from within, 100-watt lamps being used, backed by a porcelain or glass reflector. The construction is such that all legends, except the one illuminated, are practically undiscernible in daylight. Each legend is protected by a metal visor 7 inches wide, and the panel is so set that all specular reflection from the horizon and above is eliminated. The legends are used both by day and by night in addition to the lights, because of the fact that certain color-blind persons cannot distinguish between red and green.

These signals are mounted on 7-foot posts which are properly anchored to concrete bases. They are operated by automatic motor-driven controls, and may also be operated by hand in the event that something unexpected happens to the motor.

Motorists generally are becoming accustomed to this new type of traffic control. The "Walk" signal allows a 15-second period for the pedestrian to cross the street in any direction, whereas the "Get Ready" signal formerly used operated for but 5 seconds. Motorists often failed to stop for the "Get Ready" signal, with the result that many accidents have occurred at intersections on that account. It is believed this new device will operate to the advantage of motorist and pedestrian alike, in that the pedestrian who waits for the "Walk" signal will now have the right of way over all traffic. Formerly, if a motorist ran down an individual crossing the street, he was absolutely responsible, whereas now the pedestrian who is injured while crossing the street when traffic is moving will have no one to blame but himself. Under the operation of this new device, children, old persons, and mothers with baby carriages, may cross the streets in comparative safety.

DR. JOHN DILL ROBERTSON,
President, West Chicago Park Commissioners.

San Francisco's Municipal Vacation Camp

SAN FRANCISCO, CALIF.—This city, through its Playground Commission, now offers the citizens a thirteen-day vacation at the municipal camp in the Sierras, at a total cost for board, lodging and transportation of $28 for adults, $19 for children under twelve years of age, and $9 for children of from two to five years. The only additional charge is a registration fee of $1 for each camper. This opportunity for a holiday in the mountains is open to families throughout the summer season, and to supervised groups of boys and girls alternately.

The camp has a delightful location at Mather, Tuolumne County, at an elevation of 4,520 feet, in a well-watered and timbered region. It may be reached via San Francisco's own railroad, operated for 68 miles along the Tuolumne River, on which the Hetch Hetchy Dam and hydroelectric system, now nearing completion, is located. This great water-supply system, at a distance of about nine miles from the camp, is one of the points of interest to be visited by the campers. Along San Francisco's railroad are also maintained the vaca-

"STOP," "WALK," AND "GO" AUTOMATIC TRAFFIC CONTROLS AT A WEST CHICAGO BOULEVARD INTERSECTION

SAN FRANCISCO'S MUNICIPAL VACATION CAMP AT MATHER, TUOLUMNE COUNTY, CALIF.

tion camps of the cities of Oakland and Berkeley.

In the vicinity of San Francisco's camp the vacationists have every opportunity to enjoy swimming, fishing, hiking, etc., and at a small additional cost one may tour to Yosemite and other near-by points by automobile, or ride on horseback or by burro through the surrounding mountain country.

Each camper is asked to devote one hour each day to such work as the camp manager may require. The dining-room is conducted under the management of a competent chef and an assistant, and the entire establishment is maintained in accordance with the requirements of the State Board of Health and of the U. S. Department of Forestry. It has also been arranged that a physician shall be in attendance at all times.

GEORGE W. GERHARD,
Secretary, Civic League of Improvement Clubs and Associations of San Francisco.

EDITORIAL NOTE.—For a discussion of problems of camp sanitation, see pages 401-406 of this issue.

City Adopts Uniform Display of National Flag

BLOOMINGTON, ILL. — This city has adopted a unique method of displaying the national flag upon legal holidays and other festal occasions. Ten-foot poles are set at intervals along the edge of the sidewalks in the business district, and in portions of the residence districts. When the day to celebrate arrives, the poles, each bearing a large flag, are set in a socket upon the curb and a striking effect is obtained. The flags are of the same size and the uniform display of the national banner is much admired.

E. E. PIERSON.

SYSTEM OF FLAG DISPLAY, BLOOMINGTON, ILL.

Lack of Man-Power Jeopardizes Public Safety

ENFORCEMENT of existing laws and regulations relating to the motor vehicle and provision of adequate man-power to handle traffic congestion, rather than a quantity of new laws, is urged by the American Automobile Association as the first and most important step in a practical safety program.

This appeal, issued in March from the National Headquarters of the A. A. A., was based on an investigation recently concluded by the Legislative Board of the Association, of which Roy F. Britton, President of the Automobile Club of Missouri, is Chairman. Following are some of the principal facts relative to present-day traffic conditions and needs which have been developed by the Board's investigation.

1. That there is hardly a large center of population in the United States where the public safety is not in some degree jeopardized by the failure to provide sufficient man-power to handle the motor-vehicle problem and the problems related to it.

2. That what applies to the cities is equally true of the rural highways, as few states have made provision for traffic control over them, outside the few that maintain a state police or constabulary.

3. That, whereas in the last ten years the number of motor vehicles increased practically 700 per cent for the country as a whole, and 1,000 per cent to 1,500 per cent in some of the cities, the traffic force in a great many instances stands to-day at the figure it stood at ten years ago, and in some instances is actually smaller than it was twenty years ago.

4. That 80 per cent of the police officials of the country take the position that the traffic force at their disposal to-day is wholly inadequate to cope with the situation or to enforce the law, and that the lack of man-power jeopardizes the public safety.

5. That there has been no effort anywhere to maintain a scientific ratio between motor vehicle registration and the traffic control force.

Making Sure That Fire-Hose Couplings Will Fit

Information for Fire Chiefs and Superintendents of Water-Works, Regarding the National (American) Standard Fire-Hose Coupling Screw Thread Just Approved by the American Engineering Standards Committee, with the National Board of Fire Underwriters, American Water Works Association, and The American Society of Mechanical Engineers as Sponsor Organizations

CONDITIONS that permit conflagrations to go unchecked which may wipe out whole sections of cities and cause great loss of human life while plenty of fire-fighting apparatus is at hand but useless because of couplings which will not fit, can and must be eliminated, according to an announcement of the American Engineering Standards Committee. An important step in this direction has been taken in the approval by the Committee, of a National (American) Standard fire-hose coupling screw thread for all connections having nominal inside diameters of 2½, 3, 3½ and 4½ inches.

The approval of this standard, which had been submitted under the leadership of the National Board of Fire Underwriters, the American Water Works Association, and The American Society of Mechanical Engineers, marks for the first time a national agreement on tolerances or limits of accuracy necessary for interchangeable manufacture.

The lack of such an agreement has been an important cause of non-interchangeability in fire-hose couplings in use in American cities and towns, even where threads in accordance with the National Standard were supposed to be in use. This lack of uniformity, which has often led to such disastrous results, is due to failure to follow the National Standard, and to non-interchangeable manufacture. It has been shown in a startling way by the exhibit in a single manufacturer's collection of 600 sizes and variations of fire-hose couplings.

For municipalities that have not yet officially adopted the National Standard, such official adoption is the first step in this important matter, and the second consists in the resizing of the present threads on hose couplings, hydrant outlets, and special fittings. This can now be done at a moderate expense by means of sets of standardizing or salvaging tools. For further information on this point consult The National Board of Fire Underwriters, 76 William Street, New York.

Careful Inspection Essential

The official adoption of the National Standard and the resizing of existing equipment will not insure for all time the going together of the fire-hose fittings of any community. This can be accomplished only by eternal vigilance, which begins with careful inspection of all the threads of each and every new lot of fire-hose and fire-hydrants as they are purchased. It is perfectly obvious that this inspection must be also more than a casual examination of the threads and the screwing on of an old mating part to the new coupling or nipple. It is conceivable that such a procedure might accept new fire-hose or fire-hydrants which would not mate with one-half of the fire department's equipment.

Old couplings, hydrant nipples, or cast-iron hydrant caps are not reliable as test pieces or specimens owing to wear and corrosion. Modern manufacturing processes call for the use of hardened steel models or final inspection gages by the manufacturers, and hardened steel models or field inspection gages by the

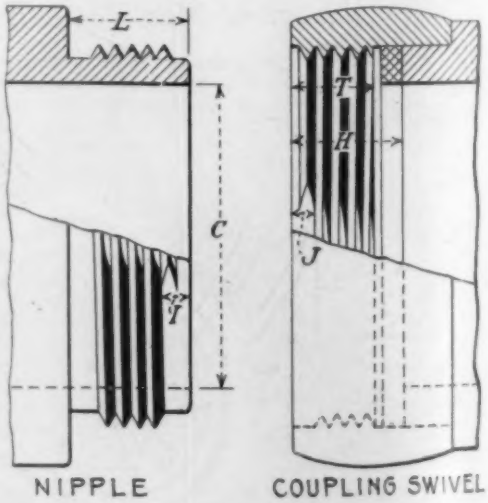


FIG. 1. TYPICAL FORM OF STANDARD COUPLING

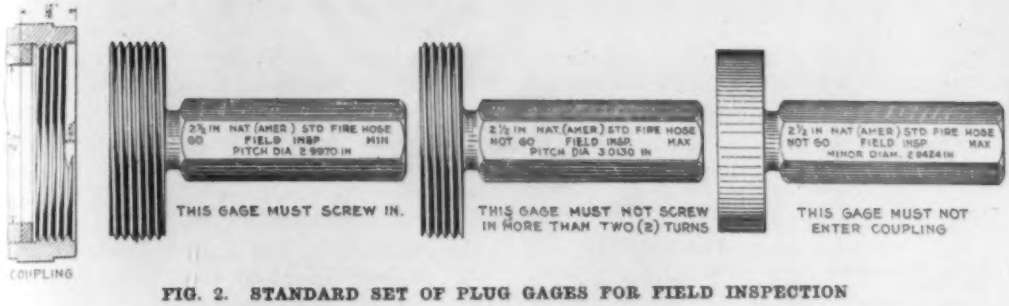

COUPLING
2½ IN NAT (AMER) STD FIRE HOSE
GO FIELD INSP MIN
PITCH DIA 2.9970 IN
THIS GAGE MUST SCREW IN.
2½ IN NAT (AMER) STD FIRE HOSE
NOT GO FIELD INSP MAX
PITCH DIA 3.0130 IN
THIS GAGE MUST NOT SCREW IN MORE THAN TWO (2) TURNS
2½ IN NAT (AMER) STD FIRE HOSE
NOT GO FIELD INSP MAX
MINOR DIAM. 2.8424 IN
THIS GAGE MUST NOT ENTER COUPLING

FIG. 2. STANDARD SET OF PLUG GAGES FOR FIELD INSPECTION

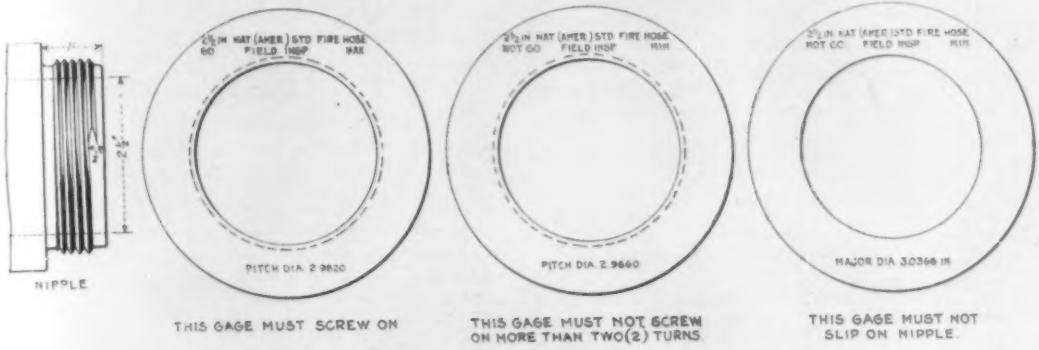

NIPPLE
PITCH DIA 2.9820
THIS GAGE MUST SCREW ON
PITCH DIA 2.9860
THIS GAGE MUST NOT SCREW ON MORE THAN TWO (2) TURNS
MAJOR DIA 3.0366 IN
THIS GAGE MUST NOT SLIP ON NIPPLE.

FIG. 3. STANDARD SET OF RING GAGES FOR FIELD INSPECTION

persons responsible for accepting the equipment. It was not, however, until the nation-wide standardization program gained its present headway that the production of these hardened steel gages became economically possible. They may now be obtained at moderate cost from the following five gage manufacturing concerns:

Greenfield Tap and Die Corporation, Greenfield, Mass.
Pratt & Whitney Company, Hartford, Conn.
Taft-Peirce Company, Woonsocket, R. I.
The Wells Corporation, Greenfield, Mass.
Sheffield Machine and Tool Company, Dayton, Ohio.

A set of standard field inspection gages consists of six pieces, three to gage the coupling or internal thread and three to gage the nipple or external thread. The first three consist of a "Go" plug-thread gage, a "Not Go" plug-thread gage, and a "Not Go" plug plain cylindrical gage. (See Fig. 2.) The second group consists of a "Go" ring-thread gage, a "Not Go" ring-thread gage, and a "Not Go" ring plain cylindrical gage (See Fig. 3.) All three of the ring gages should be non-adjustable. When applied to the threaded parts of a coupling, the "Go" thread gages, both plug and ring, insure that all parts which pass this inspection will go together and will never be too tight. This test consists in screwing the gages on the parts being tested, covering the full length of the thread. The "Not Go" thread gages, on the other hand, are used to make sure that the parts will not produce a joint which is too loose. These gages should jam at about the second thread. The "Not Go" plug and ring plain cylindrical gages check the height of the thread, which means the depth of engagement.

The field inspection gages purchased from the five firms mentioned above may be depended upon to agree with the National Standard. Should it seem desirable at any time, however, to have them checked, the Gage Section of the Bureau of Standards, Washington, D. C., is equipped to do this work. The final inspection gages used by the manufacturers may also be tested by the Bureau of Standards.

Characteristics of the National (American) Standard Fire-Hose Coupling Screw Thread

This standard is intended to cover the threaded part of fire-hose couplings, hydrant outlets, stand-pipe connections, Siamese connections, and all other special fittings on fire lines where fittings of 2½, 3, 3½, and 4½ inches nominal diameter are used. It also in-

cludes the limiting dimensions of the field inspection gages.

The accompanying illustrations and the following table are from a pamphlet on the subject issued by The American Society of Mechanical Engineers.

CHARACTERITICS OF THE NATIONAL (AMERICAN) STANDARD FIRE-HOSE COUPLING SCREW THREAD

All dimensions given in inches

1. Nominal inside diameter of hose coupling (See C Fig. 1)	2½	3	3½	4½
2. Number of threads per inch	7½	6	6	4
3. Total length of threaded part of coupling and hydrant nipple, external thread, (See L. Fig. 1)	1	1⅛	1⅛	1¼
4. Distance from face of nipple to start of second turn (See I, Fig. 1)	¼	5/16	5/16	7/16
5. Depth of coupling swivel to washer seat (See H, Fig. 1)	13/16	1⅛	1⅛	1⅛
6. Distance from face of coupling swivel to start of second turn (See J, Fig. 1)	5/16	¼	¼	¾
7. Depth of thread of coupling swivel (See T, Fig. 1)	11/16	13/16	13/16	15/16
8. Nipple (external thread) cylindrical to base of thread	...	...	..	...
9. Coupling (internal thread) cylindrical to base of thread	...	...	...	...
10. Outer ends of external and internal thread should be terminated by the "Higbee Cut" on *full thread* to avoid crossing and mutilation of thread (See Figs. 1, 2 and 3)	...	...	...	...
11. American (National) Form of thread must be used	...	...	...	...

The basic form of the National (American) Standard fire-hose coupling screw thread is the American (National) Standard form, formerly known as the "U. S. Standard Form." This form of screw thread has an included angle of 60 degrees and is truncated top and bottom in accordance with the dimensions given in tables in the new pamphlet.

A comparison of the limiting dimensions of the finished product given in these tables with those originally developed by the National Fire Protection Association Committee and published by that Association in 1905, by the National Board of Fire Underwriters in 1911, by The American Society of Mechanical Engineers in 1913, and by the Bureau of Standards in 1914 and 1917, will show that the two do not conflict. That is, these dimensions are in perfect harmony with the nominal dimensions originally specified for couplings and nipples, but are here expressed in a way to ensure the absolute interchangeability of the product. It should be noted also that they determine the size of the finished product and not of the threading tools.

[As supplementary to the above-mentioned pamphlet, two pamphlets have been prepared for the manufacturers and users of fire-hose couplings and hydrant outlets. These pamphlets are known as "Production of National Standard Fire-Hose Threads" and "Field Inspection of National Standard Fire-Hose Threads." All three pamphlets are obtainable on application to The American Society of Mechanical Engineers, 29 West 39th Street, New York.]

The Public's Representation in Rate Cases

An Editorial from the *National Municipal Review* of March, 1925

WHO should be permitted to represent the public in utility rate cases? This question has been raised in acute form by the recent decision of the United States Circuit Court in the Denver Tramways case. In this decision the Court held that a six cent fare, permitted by the indeterminate ordinance under which the company had been operating, was confiscatory, and that earlier franchises had given the company perpetual rights in the streets of the city. More important, however, was the action of the judge in excluding all testimony offered by Delos F. Wilcox, the city's consultant, on the ground that he was not qualified as an expert. In one sentence, the Court, ignoring the impressive recital of utility cases in which Dr. Wilcox has figured, explains that he is not an engineer, that he has had no practical experience with street railways or any other industrial plant, never having been "in their employ in any capacity." It was, therefore, an error in law to permit him to testify at all. The evidence excluded was designed to show that the cost of capital under the valuation allowed by the master was three or four times that of other cities. Specific evidence relating to accrued depreciation based on experience elsewhere was likewise excluded.

On the other hand, the testimony on valuation offered by the two company representatives, who were "thoroughly competent, trained and experienced engineers" and who had seen service with J. G. White and Company, the Philadelphia Rapid Transit Company and others, was accepted. Dr. Wilcox's estimate placed the valuation of the system at $9,000,000; depreciation being figured on the straight-line basis. The Court, following the engineers whom it had commended in glowing terms, fixed the valuation at more than $23,000,000; depreciation, arrived at by inspection, amounting to less than one-third that estimated by Dr. Wilcox. It may be added that Dr. Milo R. Maltbie, whose capacity as an expert was not questioned, was prevented from testifying as to the correct theory of depreciation and the weight to be given the various price bases on the ground that these were questions of law for the Court to decide.

Irrespective of the question of justice or injustice worked to one man (the Minneapolis street railway company is seeking to have Dr. Wilcox's carefully prepared testimony excluded from the pending case in that city on the same grounds as in Colorado), there is here raised a serious question as to what sort of representation is to be allowed the public in disputes with the utilities. If the city's representative must be an engineer who has been an employee of utility companies, the talent upon which the public can draw is severely limited. The time may come when engineering attains the dignity of a profession by exalting public service; but if the other qualification, past employment by a utility, holds, the cities will soon find it difficult to secure sympathetic and enthusiastic counsel. Herein lies the real menace of the Denver decision. Is it to come about that we must seek advice only from those who, by education and business relations, are generally partisans of private utilities?

Chamber of Commerce Activities in Public Affairs

Cities Having City Managers Overwhelmingly Favor the Plan

ST. JOSEPH, MO.—Unanimously endorsing the work of its City Manager Plan Committee, of which C. E. Wright, President of the Empire Trust Company, is Chairman, the Board of Directors of the St. Joseph Chamber of Commerce has agreed to place the influence of the Chamber back of a city manager plan charter written by this committee and submitted to the Legislature. If the Legislature considers the proposition favorably, it will pass an enabling act which will permit the people of St. Joseph to vote on the city manager plan in September.

The Chamber of Commerce believes that the business of running St. Joseph should be made as nearly non-political as possible, and that the city manager plan will more nearly bring about this result than any other.

Before submitting its report, the City Manager Plan Committee determined to obtain the best possible cross-section of public opinion as to actual results under city manager charters in other cities. Accordingly, a questionnaire was sent out by the Chamber of Commerce and by business houses and individuals in St. Joseph to organizations and persons in similar lines of activity in twenty-one cities throughout the United States. Inquiries were sent to and replies received from bankers, manufacturers, retailers, realtors, professional men, chamber of commerce and Y. M. C. A. executives, club women, labor leaders, etc. The questions asked brought answers as follows:

1. Is the city manager plan of city government giving your citizens more efficient service than they received under the old plan? Yes, 310; No, 7; Non-committal, 2.

2. Is this service performed more economically than previously? Yes, 268; No, 27; Non-committal, 24.

3. Do politics and favoritism flourish under the city manager plan? Yes, 44; No, 249; Non-committal, 26.

4. Is the city manager a "despot" or an "autocrat" in dealing with your citizens? Yes, 21; No, Yes, 264; No, 33; Non-committal, 32.

5. Are your citizens more interested in, and do they know more about the administration of, your city affairs than they did under the old plan? Yes, 264; No, 33; Non-committal, 32.

6. Do your citizens have more confidence in the present plan of administration than they did in the old? Yes, 292; No, 13; Non-committal, 14.

7. Has the city manager plan stimulated the building of public improvements? Yes, 274; No, 15; Non-committal, 30.

8. Would a majority of the citizens of your city vote to abandon the city manager plan? Yes, 21; No, 279; Non-committal, 19.

9. Has the quality of the personnel filling elective and appointive offices improved since the advent of the city manager plan? Yes, 242; No, 20; Non-committal, 21.

As will be seen from the foregoing, the answers to every one of the questions were overwhelmingly in favor of the city manager plan; the percentage of favorable replies being highest—97 per cent—for question 1; and lowest—78 per cent—for question 3.

A chart giving a tabulation of the replies to each question for each class of person expressing an opinion, will be sent to any reader of THE AMERICAN CITY on application to the undersigned.

HAROLD S. FOSTER,
General Secretary, Chamber of Commerce.

Chamber and City Share Cost of Highway Direction Signs

STATEN ISLAND, N. Y.—At strategic points along some of the main highways of Staten Island, ten road direction signs of a practical and attractive type were erected a short time ago, the expense of the undertaking having been shared equally by the city of New York and the Staten Island Chamber of Commerce.

The need for direction signs along our main highways was first brought to the attention of the Chamber last fall by the chairman of our Executive Committee, who suggested to the Board of

PRESIDENT SCHWAB, OF THE STATEN ISLAND CHAMBER OF COMMERCE, TURNING OVER TO BOROUGH PRESIDENT LYNCH THE CHAMBER'S PORTION OF THE EXPENSE OF ERECTING DIRECTION SIGNS

Directors that this organization make a donation of a number of such signs to the city. This idea was approved by the Board, and the proposition was then made that the city be asked to erect a similar sign for each one donated by the Chamber. The cooperation of the Borough President was sought, and through his efforts an appropriation sufficient to cover the cost of five signs was obtained from the city. The type of sign shown in the accompanying illustration was selected as the most appropriate for our needs, and an order for ten of these was placed with the Century Sign Company of Boston.

At the ceremony which attended the presentation of this organization's share of the expense to the Borough President, the President of the Chamber pointed out that the city has heretofore furnished only street signs, and that the securing in this instance of an appropriation for highway direction signs is believed to be without precedent.

RITA CHISHOLM,
Assistant Secretary, Staten Island Chamber of Commerce.

Highway Entrance Signs Built by Trade School Boys

MANCHESTER, CONN.—Since its reorganization in January of last year, the Chamber of Commerce of Manchester has devoted a great deal of time and thought to the matter of conducting an effective program of community advertising, and has made the erection of suitable highway entrance signs the first definite step in its campaign.

ONE OF TEN SIGNS OF THIS TYPE ERECTED AT HIGHWAY ENTRANCES TO MANCHESTER, CONN.

The striking, artistic sign shown in the accompanying illustration was adopted by the Chamber's committee as its standard type, and ten of these signs are now in position covering each highway entrance to the city.

The signs, which were built by the boys of the State Trade School located in Manchester, and finished in brilliant colors by a local painter, are 48 inches wide and 60 inches high, mounted on sturdy pine uprights set in cement. Several signs of this type were formerly erected in the center of the town in connection with our centennial celebration, and those have been repaired and repainted and moved to positions on the town lines. We are planning to increase the value and attractiveness of the signs by the addition of direction signs to be attached by bracket arms on either side, and we hope to arrange for their illumination at night.

Many other plans are now under way for the continuance of our community advertising program, including the erection of a set of cast aluminum direction signs at advantageous points within the town limits, and the erection of arrow direction signs at every crossroad within a radius of twenty miles of the city.

While considerable expense has been involved in the work so far accomplished, the Chamber is satisfied that it will prove to be a sound investment, since the favorable impression created on the minds of the traveling public by the unique signs cannot fail to be a distinct advantage to the community.

GEORGE E. RIX,
Executive Secretary, Manchester Chamber of Commerce.

Chamber Entertains Junior Project Workers

NORWICH, N. Y.—One of the noteworthy activities of the Norwich Chamber of Commerce last year was the entertainment of about one thousand Junior Project workers and their teachers at a 4-H rally in Norwich early in November. Each child that had completed his or her project was eligible to attend.

On the day of the rally the children began to arrive early in the morning, coming from their homes in vehicles of all types, and they then registered at the high school, which served as headquarters for the day. At 10.30 A. M. the guests assembled in the auditorium of the school, arranged in groups under their respective town banners, and there the youngsters, with their "yells" and songs, became a very lively party. A short program of inspirational talks was then given, with the state leader of boys' and girls' work, from Ithaca, and several prominent local citizens as the speakers.

As no hall large enough to accommodate all the children for dinner was available, organizations from local churches and the Norwich lodge of the Eastern Star volunteered to serve the guests at their various headquarters. A uniform price per guest to be charged against the rally funds was agreed upon, and the same menu was followed throughout. Following the dinner the group picture reproduced herewith was taken on the steps of the County Court House and then the guests, together with members of the Chamber of Commerce and Norwich Rotary Club, assembled for a short parade through the business section. In the afternoon the crowd was entertained as guests of our local theater, and each

JUNIOR PROJECT LEAGUE ASSEMBLY AT NORWICH, N. Y.

child was presented with a Junior Project cap and a rattler as souvenirs.

A particularly interesting feature of the day was the poultry show held in the basement of the high school, in which medals were awarded for the best cockerel and pullet entered by the children. The presentation of the medals was made on the stage of the theater during the afternoon performance.

The funds required for the entertainment of these Junior Project workers were raised by the Chamber of Commerce among the business men of the community, and this organization took charge of all arrangements for the rally. From the letters that have since come to us it is evident that the children had a most enjoyable outing, many of them having never before attended a theater or seen a motion picture performance. We believe that our activity in this connection has done a great deal towards establishing a fine spirit between the city of Norwich and our neighbors in the surrounding towns, and we are planning to repeat the party at the end of the present year. The Junior Project leader has reported such an increased interest in the work that we shall probably entertain a much larger gathering at that time.

ROBERT J. DORAN, Secretary,
Norwich Chamber of Commerce.

To Observe May 1 as Child Health Day

With the strong endorsement of President Coolidge and Secretary Hoover, many organizations, national and local, are preparing to celebrate May 1 as Child Health Day again this year.

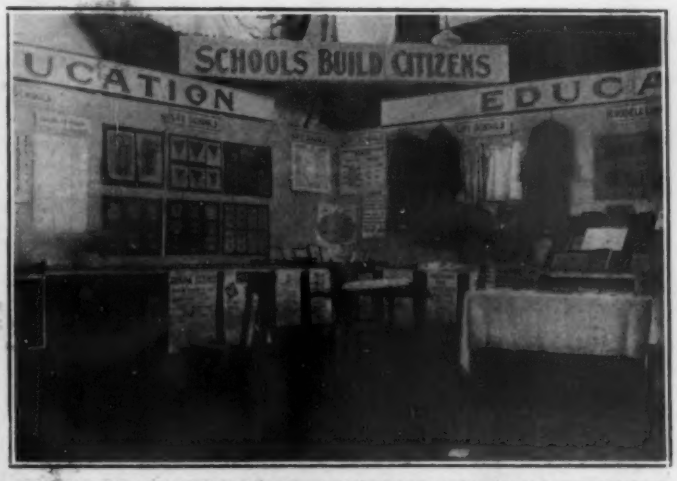
Publicity material and other aids in making the observance successful can be obtained from the American Child Health Association, 370 Seventh Avenue, New York.

A Successful Home Building and Furnishing Exhibition

MIDDLETOWN, CONN.—A unique type of "Better Homes" exposition has recently been held in Middletown under the joint auspices of the local company of the State Guard and the Chamber of Commerce. In addition to the customary exhibits of material supply houses, contractors and builders, all local mercantile interests whose lines could be readily identified with home furnishing and beautification were invited to participate. This permitted furniture dealers, hardware stores, florists, music dealers, etc., to take space in the show, and resulted in a very general representation of local business activity.

Every effort was made in the publicity material prepared for the exposition, and in all communications with exhibitors, to emphasize the need of centering each individual display as far as possible around the home-building and furnishing motive. This served not only to increase the interest of the participating firms but added greatly to the effectiveness of the entire enterprise.

In addition to booths leased by the commercial and industrial concerns, a special civic section was organized and the entire rear section of the exhibition hall was assigned for the use of the various local, civic educational and social service organizations of the community. These organizations were also invited to arrange a program of entertainment and instruction for the visiting public—an appeal to which they eagerly responded. The long hours of the exposition were thus enlivened by music from volunteer orchestras, demonstrations of the work of the schools, Y. M. C. A., Farm Bureau, Boy Scouts, the local charitable institutions, etc., and a successful balance was effected between the practical and the ideal elements in community building.



EDUCATION SECTION OF THE "BETTER HOMES" EXPOSITION IN MIDDLETOWN, CONN.

The exhibition was a complete success, both in a practical sense, and as a means of visualizing the home-building and developing facilities of the community. A large number of sales were actually consummated on the floor of the exhibition hall, and a noticeable stimulus has been given to local constructional and promotional activities.

Information in detail as to the various features of this event can be obtained, upon inquiry, from the Chamber of Commerce.

THOMAS L. HINCKLEY,
Secretary, Middletown Chamber of Commerce.

New Building of Pennsylvania Chamber

HARRISBURG, PA.—With the completion of its new building, the Pennsylvania State Chamber of Commerce, with headquarters at Harrisburg, will have its own modern up-to-date office building.

The building, of Romanesque design, is an imposing structure and presents an attractive, dignified and altogether pleasing appearance. It is distinctive as to type, the architects employing design features which clearly identify it with the state-wide service of the Chamber of Commerce.

Facing the Capitol Park, the facade is viewed to advantage from the main approach to the State Capitol. The exterior is faced with selected smooth light-buff Indiana limestone, embellished with small marble columns and a moderate degree of beautiful carving. An arched opening extending to the third-story level forms the entrance vestibule. From the exterior vestibule bronze doors lead to the lobby.

The general offices of the State Chamber are approached through the tiled lobby, and stairs lead from the lobby to the office floors above. The interior treatment of the building is finished in conformance with modern office building practice and provides ample space for the State Chamber organization, together with committee rooms, etc., for the use of the membership and allied organizations. Ample room has been provided for the future expansion of the organization.

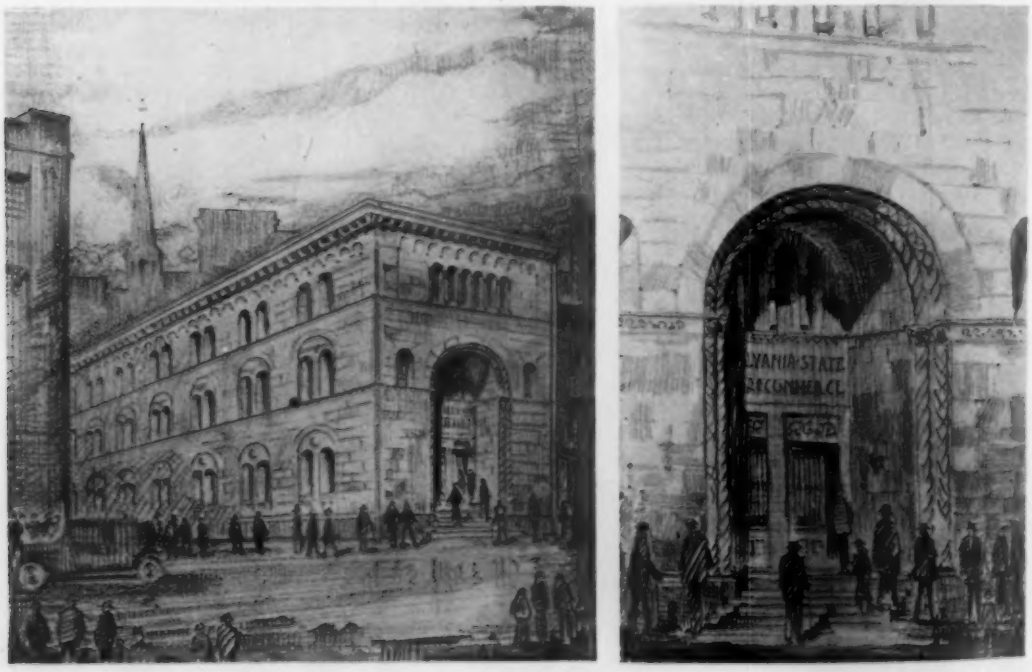
An unusual feature, but one to be commended, will be the display of the national and state colors hung from standards placed in the front wall of the building.

GEORGE E. FOSS,
General Secretary, Pennsylvania State Chamber of Commerce.

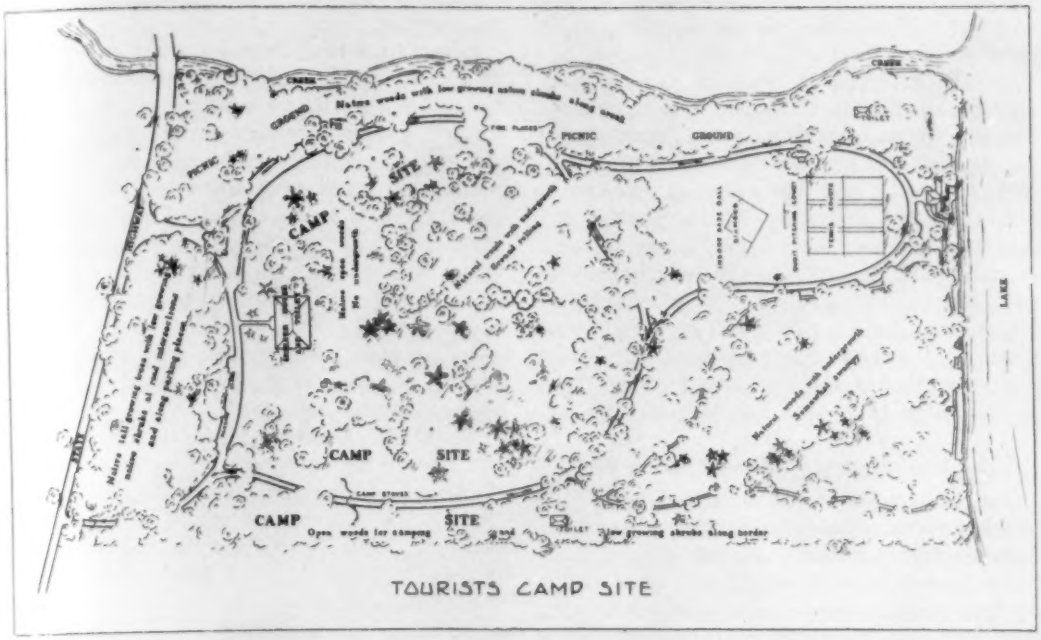
Rules for Chronic Traffic Violators

AT the second annual Public Safety dinner, held in Baltimore, Md., on February 26, 1925, by the local Safety Council, the following "Rules for Motor Drivers" were read by W. W. Cloud, chairman of the Safe Drivers' School Committee. Mr. Cloud explained that a continuous traffic violator, whose employer had tired of continually paying fines for him, had been required before being put back to work to memorize the rules:

1. The cop is always right—don't sass him.
2. Never crowd a truck to the curb.
3. Never sass a cop.
4. Never run over a crossing cop's feet.
5. Never sass a cop.
6. Steer around the lamp-posts in the middle of the boulevard.
7. Never sass a cop.
8. Always give a woman enough room to change her mind.
9. Never sass a cop.
10. Try to avoid running into the mounted policeman's horse.
11. Never sass a cop.
12. When you have been given a summons make it a point to appear—judges appreciate this.
13. Never sass a cop.
14. Never try to beat a fire engine to the crossing—picking you up will delay the firemen.
15. Never sass a cop.



THE NEW BUILDING OF THE PENNSYLVANIA STATE CHAMBER OF COMMERCE, AND ITS ENTRANCE



TOURISTS CAMP SITE

The Tourist Camp Site, Equipment and Maintenance

By P. J. Hoffmaster

Superintendent of State Parks, Lansing, Mich.

TOURIST camps are to be classed with parks. They are of the most recent and modern means for outdoor recreation. It is the automobile that has made the tourist camp ground both possible and necessary, and were it not for this form of transportation, only a few people would be able to enjoy the benefits offered by the many camp grounds.

Not always are the camps established to care for the travelers at hand, but sometimes to attract tourists, a class of travelers that are judged to be prosperous and good spenders. In other instances, natural features cause certain streams of travel. Here the camp grounds are established primarily to accommodate the tourists, rather than to attract them. Since in the one instance the camp site is established to attract the tourists, incidentally giving them conveniences, and in the other to give these travelers conveniences because of their presence, different kinds of development, equipment and conveniences are provided.

The province of this article will not permit the treatment of problems presented in the varied forms of camp sites. It will permit only brief comment on problems that the author believes belong to the type of camps established because of immediate need. But before the discussion, let us compare—to preclude confusion—the so-called tourist camp site with the earlier created institution, the state park.

State Parks Characterized

The numerous questions regarding state parks, and requests for information on them, are evidence that only a very small minority of the property-holding people really know the respective purposes of tourist camps and state parks. Because of the very newness of these things, there is no accepted statement defining them. It then behooves the author to quote no person, but to take the definition from the wide field of state park work and its possibilities.

The purpose of a state park should be at all times the recreation and satisfaction of the people. The park should contain every possible opportunity for outdoor recreation. Other satisfaction realized should come about not by

exploitation but by preservation of natural features. These sites should be adequate in size, so that their picturesque features and desirable outstanding qualities can be preserved and defined. The site should be large enough to accommodate great numbers of people and still be kept in its natural condition, not only for the sake of diversified recreational opportunities, but also for the purpose of education, both scientific and popular. A state park should contain out-of-the-ordinary natural features, such as primeval forests, unusual water privileges, or unique geological formations. Such features will insure the permanent use of the park by the public, without depreciation of its original value.

The Essentials of a Tourist Camp Site

Tourist camp sites should also furnish out-of-door recreational advantages. The other features increase the value of a camp, but their absence is not so significant. Accessibility by a main highway is a salient point. With this, and with trees for shade, a site near a city or town can be considered suitable for a tourist camp, providing it is neither too hilly nor too swampy. The area of this type of park may be from 1 to 20 acres, and it requires a particular kind of development and management.

The first essential is the preparation of a plan. The grounds must be studied with regard to service buildings, space for tents, picnic grounds, fireplaces, water-supply, etc. The layout having been decided upon, the roads and footpaths must be built to conduce to easy and effective management. The importance of good management cannot be too greatly emphasized. News of a well or a poorly managed camp ground travels fast and wide, and patronage and other results are proportionately realized. Experience has proved that the traveling public will put up with certain inconveniences if the grounds and buildings are kept clean and orderly. But where convenience and order are both absent, and where the general surroundings are inclined to filth and sloppiness, toleration gives way to other feelings and the words "Stay away" are immediately broadcasted.

The Management

As in many other businesses, the question of management practically determines the success or failure of the tourist camp site business. Unless some means of management is in sight, this business should not be started, for tourist camps do not run themselves. They must receive some attention other than that of the traveler.

Forms of management are quite as variable as are the types of sites, but the majority of camps are operated by some municipality. Besides this, there are sites provided by certain clubs—Rotary, Lions, Kiwanis, etc. Others are provided and maintained by religious organizations. Commercial clubs and boards of commerce have made splendid accomplishments in this work. In some localities, groups of leading business men furnish the site and equipment. In still other cases the tourist camp grounds are provided on a cooperative basis. To the writer this method is indeed unique. Some individual, who is convinced of the need and value of a local camp ground, will acquire the site proper. Furniture, equipment and developments are effected through gifts of the different merchants and places of business, while the camp is cared for by still another party. The camp site that is operated and maintained entirely by private means also takes its place in the list.

Roads and Planting

Some of the sites selected for tourist camps still contain the native trees, shrubs, and undergrowth. One of the first steps of development is to clear away brush, dead trees, forest litter and stumps. By all means fire hazards should be removed; they should be cleaned up, not alone to prevent fires and the resultant damage, but also to eliminate catch-all places for tin cans, papers, and refuse of every variety.

But not all of the undergrowth and so-called brush (native shrubs) should be removed. Often there are splendid varieties of shrubs that will add much to the camp environment, if properly utilized. By keeping groups of these shrubs, the site can be naturally divided into desired sections. By their use effective screening of buildings, roads, and various conditions may be obtained; in fact, these often are the very kind of shrubs that are taken from nurseries and planted in parks. Since they are native and already present, every effort should be exercised to use as many of them as conditions will permit.

Besides the highway to the site proper, there must also be service or interior roads. Such roads frequently cause much dissatisfaction, simply because they were not properly located and built. It should not be implied that expensive and elaborate roads are necessary. This is not ordinarily true. But the trouble usually comes when a one-way traffic road is

built where there should be a two-way road. The converse will cause equally as much confusion.

When possible, one-way traffic roads should be installed. Where such roads will serve, a two-way traffic road should not be built, not only because of the unnecessary expense, but because the disposition of all traffic becomes more difficult. By having all traffic move in one direction, congestion and confusion will be prevented. It will also be evident to travelers where to enter and where to leave certain areas. One-way drives also mean greater safety to pedestrians, women and children in crossing the road. They further mean transportation through the camp grounds with the least possible disturbance of natural conditions — trees, shrubs, knolls, ravines and hillsides.

CAMP SITE, TRAVERSE CITY STATE PARK, MICHIGAN

SUNDAY MORNING BREAKFAST IN TRAVERSE CITY STATE PARK

Every consideration should be given the location of roads. The small area available does not offer much choice so far as scenic beauty is concerned. But other factors that must be considered are open places that must be kept intact for tent sites; wooded areas that furnish picnic grounds; also, smaller open places to be used for tennis courts, horseshoe pitching and hand-ball. All these points should be established, and roads located accordingly. Then there are the natural conditions—slopes, hollows and ridges; the course that surface water takes after showers, and numerous other details peculiar to each site; these should all be considered in the plan and in making the roads.

Only the briefest statement need be made regarding road material. With few exceptions, this will be determined by what is available—gravel, crushed stone, cinders or other material. Unless it is absolutely necessary, concrete is not favored. Very loose or beach sand may require a hard-surface road. In some cases just a native soil or dirt road can be built; whenever possible and practical, it is to be desired.

Water-Supply and Sewerage

Pure and fresh drinking water is an important provision in the camp grounds. The choicest kind of water, or the best way of furnishing it, is through flowing wells. Where these are impossible, running water, either from mains of the municipality or from an individual system, is to be preferred. Both systems make possible a distribution of water throughout the park. Where the water is furnished through well or spring, care must be exercised to guard against contamination by pollution. This, of course, can be done by deep driven wells and by proper disposition of surface water and other wastes.

The camp grounds cannot be kept neat and clean without sanitary conveniences in the form of comfort stations, garbage and débris cans, baskets and incinerators. Of these, the most important are the comfort stations, or the means of disposal of sewage. There are many systems recommended for this task, but for attendances of any size, no system can surpass or equal the water-carrying system. Such a system is made possible by a flowing well, water from mains, or an individual system. When arrangements are made for any

one of the three systems, the sewerage system is practically solved. If connection can be made with a sewer, it is to be favored; but if sewer lines are not available, septic tanks are the next best. In very sandy soil and where there is ample room, cesspools will serve, but this is not recommended.

Where running water is unavailable, sewage must be cared for in some other manner. The old-fashioned privy no longer serves the thousands using these conveniences. Of the newer methods, there are several chemical outfits that have served to great advantage, but not all are suitable when used by large numbers. Chemical outfits wherein good-grade caustic chemical is used, seem most adaptable for heavy use. Tanks or containers are so made that they can be installed in batteries if necessary. The chemical used is placed in the tank receiving the effluent, which later becomes a semi-liquid and can then be drained off into cesspools, where it leaches into the ground.

All systems, to be sure, get their share of praise and blame, but where chemical outfits have been used it has been noted by the writer that when they are installed and operated according to the directions of the makers, the results have been quite satisfactory—which means disposition of these wastes with practically no odor and little trouble.

Refuse Disposal

Catch-all baskets and receptacles for garbage will serve admirably in helping to keep the camp site clean. If they are present, they will be used, but their absence is about the first step towards littered-up grounds. Right here it can be said that the greatest assistance any management or custodian can solicit is the assistance of the tourist camp patrons. In a number of cases it has worked out that the best-kept grounds were in charge of custodians who enlisted the services of their guests. The tourists are welcomed to camp sites that are immaculate and in order. That the grounds are constantly maintained in this condition is understood, and it naturally becomes a custom for every one to care for and dispose of his own wastes.

As to the type of garbage cans or paper baskets, some, to be sure, are better than others, but these points can usually be determined with no great amount of experience. One thing regarding receptacles for perishable wastes—they should, by all means, have covers. Good covers will keep out flies and dogs, and will keep objectionable conditions unexposed to passers-by. Catch-all baskets made of woven wire are most serviceable when of the smaller—1- to 1½-inch—mesh.

Accumulated wastes are best disposed of by burning. There are, of course, various other methods. While a certain amount of the perishable stuff may be buried, it is only a matter of time until this becomes impracticable. To dispose of it by dumping in streams or lakes is not only a temporary disposition of it, but the act is usually a violation of state laws. Where the attendance is small, fireplaces can be used to burn wastes; but where it is large, incinerators are almost a necessity.

Various Conveniences

Other conveniences that add much to the tourists' comfort are tables, seats or benches, fireplaces and fuel, coolers for food, bathhouses and clothes-lines. These lines are, of course, private property, but not so with the tables. Several types of tables have been used. Permanent tables and seats, built on posts, are satisfactory where there is ample space and few tables are required. The combined movable seat and table has been used, but is not so satisfactory, because of high costs and difficulty in handling. The outfit that has proved most useful is the table top, 30 x 72 inches, supported by two wooden horses. For seating purposes, a commercial type of settee, wood slats on iron frames, 5 feet in length, has served well. Such benches or seats are most useful wherever seats are needed.

Three factors should be kept in mind when such conveniences are provided—the initial cost, the usefulness for all-around purposes, and the storage space.

The fireplaces are usually thought of as conveniences for the users. Often only this one point is considered in designing them. Campers and tourists are many times blamed for causing forest fires by leaving their fires uncared for. In view of this, fireplaces should be both useful and safe. The private gasoline stove is replacing many of the permanent ones, just as are gas plates and electric cookers. But there is, nevertheless, a big need for economic wood- and charcoal-burning stoves. For primitive effect the crackling wood fire and blue smoke takes the lead. This, in itself, calls many to the great outdoors. The novelty of gathering and cutting wood is attractive, and these attractions cannot be ignored.

I would propose, then, equipping the camp grounds with one of two kinds of stoves—wood or charcoal. If wood, it should contain a fire-box about 10 inches deep by 16 inches

FIG. 1. ONE TYPE OF BATH-HOUSE

FIG. 2. OUTDOOR COOLING SYSTEM

wide and 28 inches long. Such will accommodate the average party and will require no great amount of fuel. It can be made of concrete, brick, or field stone, cast iron or sheet steel. All are being used and are satisfactory. Where stoves burning charcoal are used, some provision must be made to furnish fuel at a central location. This can usually be handled by a concessionaire, in small bags sold to campers.

A convenience which has proved most popular is a running-water cooling system. Where there is a flowing well, stream, or spring, a structure containing small or individual compartments serves well for storing milk, butter, eggs, etc. Water can be piped in from the supply, and caused to run through compartments, constantly keeping the food cool. Stone or concrete will serve well for this purpose.

Buildings in a camp site either add to or detract from the general appearance of the place. The determining factor is the general design of the structures and their location. To get these structures designed and placed harmoniously is not difficult. If their need is first clearly determined, the size necessary to satisfy the need worked out, the kind of building material decided upon, at the same time with reference to the general conditions surrounding the location—these factors, if properly combined, will generally bring about suitable structures and pleasing effects.

Where there is a lake or a river offering bathing facilities, the bath-house and other conveniences often present problems. It has been proved that if the patronage will support it, the most satisfactory way to conduct this business is to supply bathing privileges at a nominal charge. A checking-in-and-out system with individual lockers makes an easy way of management, but individual lockers usually mean a considerable outlay of capital. This is not always available. And then baskets can well be used in place of lockers. Baskets can be installed at a much smaller initial investment; besides, not more than a quarter of the housing space is required. With the baskets go, of course, a series of dressing-rooms.

Where it is desired to provide bathing privileges gratis, a different system must be installed. The number of persons that can be accommodated in this way is, of course, small.

FIG. 3. A TYPE OF CAMP STOVE

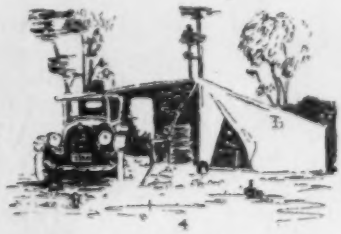


FIG. 4. A CAR AND TENT COMBINATION

FIG. 5. CAUSTIC AND CHEMICAL OUTFIT AND ENCLOSURE

It is nevertheless a service that is worth while and appreciated by patrons. Here only the building is provided. It is made into individual booths equipped with a hasp or bolt on the outside of each door for a padlock, which is furnished by the person using it. The booth furnishes both a dressing place and a safe place for clothes and valuables while swimming. Each booth should have a separate door and should open to the outside. Such an arrangement enables the users of booths to see them while swimming, for the building should be placed with its end toward shore and should be in sight of the bathers.

The demand for tourist camp grounds seems to be increasing. Just what they will develop into, or what will develop from them, is a moot question and can be coped with when presented. But certain problems are already here which require solution. That all of these problems will exist permanently is not likely; nor is it probable that to-day's remedies will in every respect satisfy the needs of to-morrow.

The Big Business Man in Neighborhood Welfare Work

By Paul Franklin
Executive Secretary, Bowling Green Neighborhood Association, New York

THAT the big business man will interest himself—promptly, spontaneously and generously—in any local community welfare movement which strikes his practical mind as sound in principle, has been strikingly attested lately in connection with the gift of a new $250,000 building to the Bowling Green Neighborhood Association, which carries on a program of health, recreational, social service, and citizenship work in the extreme lower end of New York City.

William Hamlin Childs, the New York financier who is to provide the new building, made it a condition of the gift that the Bowling Green Association should guarantee to increase its annual operating income by at least $40,000. Within less than a week of the announcement of the Childs offer, thirty business men and institutions, with offices in the skyscraper section of lower Manhattan, had each subscribed $1,000 a year for three years, and the pledging of the necessary balance was considered an immediate certainty.

It seemed, in fact as in name, a real, old-fashioned neighborhood affair—prompt, warm-hearted, altruistic. The inhabitants of the district served by the Bowling Green Association live in crowded, antiquated tenements immediately adjacent to the towering skycraper section of lower Broadway—home of the largest and most important commercial enterprises in the world. Moreover, most of the residents of the Bowling Green district are employed in the big business and industrial buildings which lie so near their tenement homes. They constitute that small army of scrub women, porters, watchmen, janitors, elevator men, window washers and laboring supernumeraries who play their very necessary part in the operation of the mighty structures in which the big business man has his offices—and the big business man has been quick to feel a very special neighborhood responsibility for their welfare.

The Bowling Green Neighborhood Association is supported and managed wholly by business men of down-town New York. It was established in 1915 and has been serving heretofore the area south of Liberty Street between the Hudson and East Rivers, with headquarters in a remodeled tenement. With the added facilities of a new building and increased operating revenue, it is planned to extend the operating field considerably northward into a section in which infant mortality and the death-rate from tuberculosis have been particularly high.

In addition to the present health, recreational and social service activities, which are to be much intensified, the enlarged program of the Association will include intensive maternity service, nutrition and posture classes for children, and training for young mothers and older girls in home economics, domestic science, needlework, dressmaking and millinery. A fully equipped gymnasium is planned, as is also a model apartment to be used for illustrative work in the home economics and domestic science classes. In cooperation with other Americanization agencies, instruction in English, civics and other citizenship subjects will be given. In a word, "Wall Street's neighbors" are to have the benefit of every helpful activity known to the modern social service worker.

Timber Structures on Oregon Highways

By C. B. McCullough
Bridge Designer, Oregon State Highway Department

THE design practice of the Oregon State Highway Department as regards loading specifications for timber trestle bridges differs somewhat from that adopted in the Middle Western states and other localities. Outside of Oregon, owing to the comparatively high cost of lumber, trestle construction does not prove economical for heavy traffic loadings, and in general such type is used only for light-traffic bridges and more or less as a temporary expedient. In Oregon, where structural timber of high grade is abundantly available, a different condition exists. Timber trestle construction in Oregon utilizes material which is many times available at the site or comparatively near the site. Throughout the timbered sections small mills capable of cutting bridge lumber are abundantly scattered over the territory, and in many cases timber may be obtained with a comparatively short haul for sites where other structural materials must be hauled over mountain roads for a prohibitive distance.

COVERED TIMBER BRIDGE OVER GRAVE CREEK NEAR GRANTS PASS, ORE.

The location mentioned above are not necessarily on lateral roads, but on heavy traffic roads over which the logging industry imposes a heavy duty. In view of this, trestle construction has been divided into two classes:

Class A. Heavy traffic structures comparable, as regards carrying capacity, to the heaviest type of permanent construction.

Class B. Trestles designed for light traffic and used on market and lateral roads. This type of construction is more nearly comparable with the trestle construction used in some of the Middle Western states.

END VIEW OF 105-FOOT SPAN BRIDGE ILLUSTRATED ABOVE

Details of Construction

Since many of the timber bridges are on heavy-traffic roads, they must be designed for a long period of service with a view to periodic maintenance by regularly organized bridge gangs in much the same manner as is customary in railroad practice. To accomplish this, more attention has been paid to structural details than is ordinarily the case in timber highway trestles. All connections, including hand-rail connections, are bolted. Careful attention is paid to such details as drainage and ventilation of decks, waterproofing at felloe-guard junction, felloe-guard splices, entrance turnouts, stringer braces, bulkhead details, etc.

Not only are all details designed with a view to ease of maintenance and renewal, but the large margin of safety in the stringer system gives the structures a much longer service life than is ordinarily the case in this type of construction. Because of this, timber trestles as built in Oregon have a service period at least 50 per cent longer than the light type of construction formerly built.

Decks

The type of deck universally adopted for this work is the laminated or strip type, as distinguished from the plank deck formerly laid. For equivalent thickness, this type of deck wears longer and also remains

smooth for a longer period because the wear is against the edge of the grain, as in the case of ordinary edge grain flooring. The laminations are very carefully spiked together by horizontal spikes. Formerly, 30-penny nails were used, but the size has been increased to 40-penny nails, so that each nail passes through two laminations and about two-thirds of the way into the third. Each lamination is spiked to its neighbor twice between each pair of stringers. This precaution was found necessary in order to avoid excessive vibration under load, with a consequent tendency to form cracks in the pavement surface when paved decks are used.

Treatment of Deck Surfaces

On paved highways the laminated decks have been paved with from 2 to 4 inches of asphaltic concrete surfacing. For the most part this type of pavement has given satisfaction, although in many instances transverse cracks are observed in pavement surfaces which have been down from two to four years or longer.

In lieu of the pavement surfaces, the application of a thin mastic or carpet coat, consisting of an asphaltic flush coat, followed by a coat of screenings of pea gravel, has recently been adopted. This type of floor covering costs from 30 cents to 40 cents per square yard and will last for about two or three years, after which time renewals and patching are necessary. A second renewal of the carpet coat probably costs considerably less than in the first instance, although there are no cost data as yet.

On macadamized highways, a policy of waterproofing the laminated decks with pitch or asphalt and carrying a 2-inch macadam top coat clear across the trestle, has been adopted. This, as far as riding qualities are concerned, has proved the most satisfactory method of treating trestle floors on unpaved highways.

Economics

The first cost of timber trestle construction is from $22 to $28 a lineal foot. Concrete viaduct construction under the same conditions would probably average $120 per lineal foot. The total annual cost per lineal foot for trestle construction would be as follows:

Interest on first cost at 5 per cent	$1.25
Sinking fund for renewal in 10 years (4 per cent)	2.08
Estimated annual maintenance cost	1.25
	$4.58

As against this cost, the interest alone charged on concrete viaduct construction would amount to $6 per foot per year. These figures would apparently indicate the wisdom of wood trestle construction. There is, however, the consideration of possible fire hazard and of architectural treatment on important highways, so that the selection is generally decided on the fact of whether or not funds are available for the more expensive types of construction.

Timber Truss Construction

Owing to the plentiful supply of local structural timber and to the extremely long hauls for structural steel, the timbered areas of the West can economically use a timber truss construction of a higher type than in other localities. Here again, as in the case of trestle construction, Oregon practice differs from that of the Middle West in that a high type of timber truss construction is adopted, and used on some of the heaviest-traffic roads, whereas, throughout the Middle West and in the unforested areas, timber trusses are generally used only for light-traffic loading and as a temporary expedient.

For the heaviest type of construction, cast angle blocks for the joint details have been adopted, and metal splices for the lower chords are used with a view to a long-time service period.

Housing

The service life of timber truss construction may be increased two or three times by completely housing-in the truss and floor system. There are quite a number of old housed truss bridges throughout Oregon which have been standing for over 40 years. The writer has examined some of these and found that the timber in the truss itself was entirely sound, and were it not for the fact that these trusses are obsolete as regards carrying capacity, they would have a future service life of many years. Throughout the New England states there are quite a number of covered truss bridges which have been standing for over a hundred years, and there are a number of covered bridges in Pennsylvania that were built long before the Civil War and are still standing and in first-class shape as regards condition of the timber, although obsolete as regards carrying capacity.

Preservative Treatment

The only preservative treatment employed in Oregon in connection with bridges consists of a brush coat or an open tank or vat treatment. For this purpose a high-grade creosote oil, known as Carbolineum, is used. Not all of the surface of the structure is treated; the oil

is applied only to contact surfaces, timber on timber, timber on masonry, or timber against earth.

If pressure treatment were used, at least a 12-pound treatment would be required, and possibly a 16-pound treatment for stringers, floor beams and truss members, so that it is obvious that the cost for material would be increased nearly 200 per cent. By increasing the cost of timber construction to this degree, it would be very questionable whether or not such types of construction would show economy in comparison with permanent steel or concrete work.

In regard to pressure or impregnation treatment, the last quotation received from a local creosoting company was as follows:

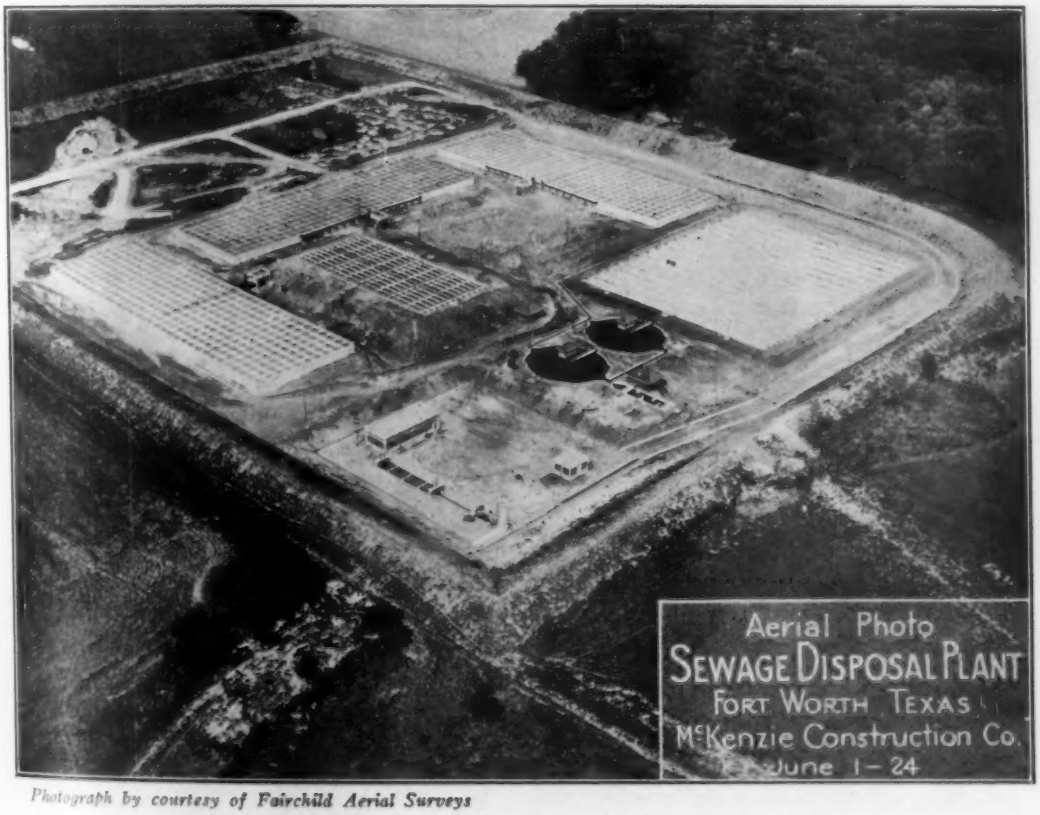
Cost of treatment only—	
10-lb.	$31.00
12-lb.	35.00
16-lb.	41.00
Cost of treated lumber—	
10-lb.	$52.75
12-lb.	56.75
16-lb.	62.75
Difference—cost of lumber—	
10-lb.	$21.75
12-lb.	21.75
16-lb.	21.75

ACKNOWLEDGMENT.—From an address delivered at the semi-annual convention of the Western Association of State Highway Officials. Illustrations by courtesy of the author.

Compulsory Attendance at Road School

ONE of the most successful recent road schools was that held at Purdue University, Lafayette, Ind., January 19-23. A wide range of subjects was discussed during the week under such headings as construction, maintenance, drainage, equipment, road laws and allied subjects. Indiana is rather unique in having a law compelling county highway superintendents to attend the Road School, with all expenses paid by the respective counties. A similar bill is being advanced in the present legislature in behalf of the county surveyors.

Several of the leading discussions of road subjects presented at the Purdue Road School will appear in part in THE AMERICAN CITY at a later date.



Photograph by courtesy of Fairchild Aerial Surveys

AIRPLANE VIEW OF FORT WORTH'S NEW SEWAGE DISPOSAL PLANT

Finding the Common Denominator in the Public Safety Problem

By Earl J. Reeder
Public Safety Division, National Safety Council

IS public safety a game of chance? Is there any rhyme or reason in the way people are killed upon the streets and in other public places of our cities? Is every city a law unto itself or do cities large and small and far apart have some of the same safety problems to solve? The National Safety Council is trying to answer these questions by intensive studies of representative cities.

Four community safety surveys have been made by the Council up to the present date (February 25). These surveys cover accident prevention upon the streets, at the homes, and in the industries, but the first of these phases will be of greatest interest here. From such surveys in Kansas City, Cincinnati, St. Louis, and Cleveland, coupled with observations in Chicago, some outstanding points of similarity have been observed.

Three Outstanding Public Safety Needs

1. Application of engineering skill to determine areas of traffic hazard and the need for means of regulation
2. Promulgation of regulatory measures to synchronize movements of the several kinds of traffic
3. Education of pedestrians and vehicle operators in the proper relation between them in their use of the streets

Sixty to seventy-five per cent of the fatal public accidents in these cities involve motor vehicles. Spot maps were developed for each city, showing the distribution of these motor vehicle fatalities. They indicated a marked similarity among these cities, in that motor vehicle fatalities:

1. Occur with less frequency in congested business districts;
2. Are quite infrequent in high-grade residence districts;
3. Are largely confined to main and traveled streets radiating from central business districts;
4. Are most prevalent in the congested residence districts constituting the zone of transition from congested business to high-grade individual residence sections.

The foregoing pretty definitely defines the boundaries of the greatest traffic safety problems and indicates where community interests concerned with these problems should devote the major part of their attention. But defining *where* the problem is doesn't define *what* it is, and other facts have been sought.

It has been uniformly observed in these surveys that 65 to 85 per cent of all motor vehicle victims are pedestrians. Some, often referred to as "jaywalkers," are killed between street intersections, including children playing in the streets. But the majority of pedestrians are killed *at intersections*. What is the correct preventive measure? Not an easy one, but a necessary one, and the citizens of our municipalities must and will take it.

There must be a new relationship between the motor vehicle operator and the pedestrian. The latter must cross the streets and the former must move along the streets *with some uniformity*, if they are to make any headway. Each has a responsibility to the other. If the pedestrian attempts to cross only at the street intersection, the motorist should let him cross in safety without unreasonable delay. If the motorist exercises proper precautions at intersections, the pedestrian should respect them by crossing at intersections only and subject to reasonable regulations.

This solution involves two things, namely, education and regulation, with enforcement for those who will not submit. The public must be taught to recognize their obligations both as pedestrians and as drivers. Vehicular traffic on busy streets should be stopped at regular intervals to let pedestrians cross in safety at properly designated crosswalks. Each class of traffic should learn to proceed in its turn. Crosswalks should be plainly designated by pavement markings for the benefit of both motorists and pedestrians. Proper means of traffic control should be located at frequent intervals along heavy traffic streets, particularly at "peak" hours.

The motor traffic safety problem is not entirely pedestrian. A smaller part involves

SPOT MAP SHOWING THE DISTRIBUTION OF FATAL AUTOMOBILE ACCIDENTS IN CLEVELAND DURING 1923 AND 1924

Over 80 per cent of these victims were pedestrians. Note the density of spots east of the river in the congested residence districts. They follow heavily traveled streets

collisions of various kinds. These collisions occur when operators lose control of their vehicles or fail to understand or respect the acts and intentions of others. Some of this is due to wilful disregard of approved safe practices. Another, and, I believe, a larger part is due to uncertainty of movement through lack of properly designated lanes of travel and synchronism of movement.

Here, again, pavement markings are highly important and should be used freely to show safe lanes of travel and proper precautions in traffic movement. Standard regulations should be given liberal publicity, and signs should be extensively used in proper locations to call attention to special hazards.

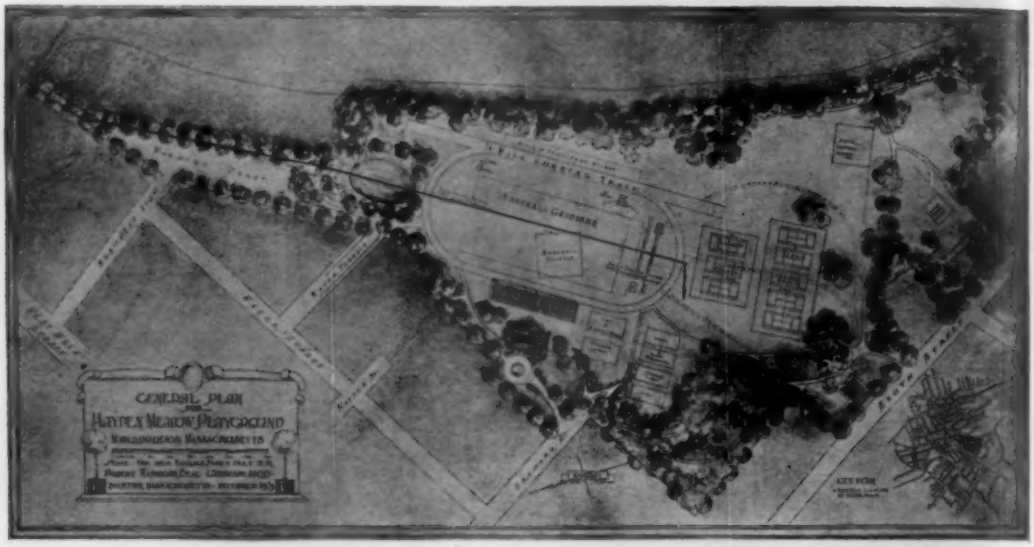
In many cases the attitude of traffic policemen needs correction. They must function primarily as regulators and instructors of traffic. The have vastly different jobs from those of the patrolmen, who deal primarily with criminals and whose job is to quell disturbances and to apprehend violators in criminal cases. The traffic policeman controls the movements of thousands who welcome his directions and gladly abide by them, with no other thought than full submission. Dealing with these in the same manner as with criminals is quite un-American, but dealing with them in the sense of public service receives a wholesome response in the form of a safer community.

Moral Education and Civic Service

WE applaud the increased emphasis being placed upon character training in the schools of our country. The systematic effort to so organize the school as to make of it a civic and moral workshop is a forward step and merits encouragement of school authorities.

"A principle which has been proclaimed by the Association from the beginning, that the chief aim of public education is the training of the citizen to live up to American civic, political, and moral ideals, we reaffirm together with our resolve to direct the daily exercises of our schools predominantly toward this end."

—From the resolutions adopted at the annual convention of the National Education Association, Department of Superintendence, in Cincinnati, February, 1925.



How Marlboro, Mass., Developed a Model Playground in the Heart of the City at Low Cost

By Robert Washburn Beal
Landscape Architect, Boston, Mass.

"THE play of children has the mightiest influence on the maintenance and non-maintenance of laws," wrote the great philosopher Plato many centuries ago. The importance of this fact is beginning to be realized by America to-day. But many American cities have grown so fast that when the absolute necessity for providing adequate park and playground spaces has finally been made clear to them, they have had to acquire the land at terrific cost; whereas, had they foreseen the need for such provisions, adequate space advantageously located could have been secured at a small fraction of the price they have later been obliged to pay.

Not all cities, however, are waiting to learn from their own costly experience the lesson already learned by others. Marlboro, Mass., is not. This progressive city of approximately 15,000 people recently voted to purchase a 20-acre tract of land near the heart of the city. Because of the foresight of the Mayor and the City Council, the city acquired a spacious and ideally located playground and recreation center at very low cost.

It was not until title to this tract was being transferred that its historical significance became generally known. The grandfather of General Artemas Ward of Revolutionary War fame at one time owned and operated it as a farm. General Ward was seriously considered for the leadership of the Continental Army, being second only to George Washington in the number of votes for that honor. In view of this fact, the Ward family offered the city a memorial gate and entrance, and the City Council of Marlboro decided to name the new play and recreation center the Artemas Ward Playground.

The north end of the new playground, on which considerable work has already been done, is within five minutes' walk of both railroad stations, and it is practically adjacent to the main business section of the city. Little more than a block away is the High School, which the new athletic field will most admirably serve, and none of the elementary schools is more than three-quarters of a mile away. The real importance of this foresighted action will probably not be fully realized until years later, when the value of this and surrounding land will have grown into enormous figures.

Waste Land Reclaimed

The tract of which such good use is being

made was in reality waste land, being largely an old brook bed with a small stream still flowing. There was an old dam on the place, which in winter-time was used to flood a part of the tract to form a skating-pond. Although part of the land is fairly level, particularly the portion above the dam, much of it is on rather steep slopes towards the streets which surround it on all sides.

At first sight such a tract might seem undesirable for use as a play and recreation center, but every advantage has been taken of the natural contour of the ground, so as not only to cut the grading work to a minimum, but also to make the greatest use of the property. As a result, the tract is being made into one of the most attractive and inviting play and recreation centers in the east.

By slightly raising the level and cutting into the sides, the upper meadow is being formed into an excellent athletic field with a football gridiron, a baseball diamond, a quarter-mile running track, spaces for track and field events; and adjoining the field are eight tennis courts and several basket-ball and volley-ball courts. The slopes are being utilized for winter sports, one of the first steps taken being the development of a ski-jump and a toboggan-slide.

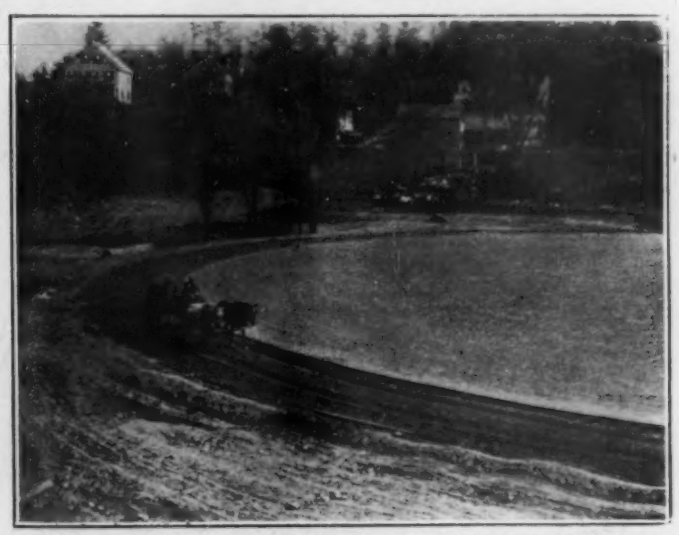
Other sections of the tract will contain play space and equipment for the younger children, where they will be able to get in and out quickly and not have to cross the older boys' playing space or get near vehicular traffic. Here will be provided a wading and swimming pool, 140 by 85 feet, swings, tilts, sand-boxes, merry-go-rounds, slides and various other equipment. In connection with this section, a small park house is being provided for the mothers. There will also be a junior boys' baseball diamond and a playground for intermediate children. The tract is really being developed in three sections, the center being given over to organized athletics, one end to park and recreation space, as already described, while the other end will be used as a public parking space. Town teams will also be given an opportunity to use the athletic field, especially through the summer. And for the older people, walks and picnic groves are being developed. Many trees will be planted to provide shade and to make the grounds as attractive as possible.

Solving the Problem of Drainage

As all the surface water from the northern and western part of the city of Marlboro enters the brook which flows through the center of this tract, and as this territory is subject to heavy rainfalls, one of the most important and difficult problems to be met in the development of this area was that of proper drainage, without which a firm, lasting foundation for the athletic field and various courts would be impossible. For carrying the heavier drainage, approximately 1,700 linear feet of Armco ingot iron culvert pipe, in diameters of 42, 36 and 30 inches, was installed. This work was done under the supervision and approval of the Superintendent of Streets of the city of Marlboro.

The whole undertaking as planned calls for the expenditure of about $120,000 for the land, buildings, grading, draining, equipment, etc. However, this is not all to be done immediately. It is proposed to complete the work in six years, spreading the cost out so that the burden will not be too great in any one year. The first appropriation of $50,000 will pay for the land, the construction of the athletic field and running-track, and a large amount of rough grading outside the athletic field area. Public approval of this expenditure was aided by the display of the accepted plan, here reproduced, showing just what the final development will be like.

The planting of trees, shrubbery, etc., will



THE LOWER END OF THE OVAL OF THE MARLBORO PLAYGROUND
In providing adequate drainage 1,700 feet of iron culvert pipe was used. Part of the pipe ran the entire length of the oval. A manhole is located near the length of pipe shown at the left end of the oval

follow immediately upon the completion of the grading. The construction of the junior baseball diamond and the intermediates' playground will be begun as early as possible, in order that the younger and smaller children may have a safe place to play, away from the more strenuous games enjoyed by the older groups.

Development of the parking space will not be begun until much of the other work has been completed. It is possible, however, that the need for this accommodation may become so pressing within the next year or two that the business men of the town will arrange for an additional appropriation to develop this part of the program much earlier than is now contemplated. The building of a field or club house, which is included in the general plan, will also be deferred. When the entire project is completed, the city of Marlboro will have a play and recreation center of which it may well be proud.

A Gift to the City of Dallas

THROUGH the generosity and civic spirit of one of its citizens, Royal A. Ferris, the city of Dallas has become the possessor of one of the most beautiful electrically illuminated pan-chromatic fountains in the country. The fountain, located in the plaza fronting the Union Railroad Station, was recently formally accepted by the Mayor of the city at a gathering of citizens assembled to witness its inauguration.

The fountain consists of a large basin, 50 feet in diameter, inside of which is an elevated inner basin 14½ feet across. From the center of the inside basin a jet of water rises to a height of 75 feet, illuminated to the very top by beams of light of constantly changing color from four powerful incandescent search-lights concealed in a glass-covered room beneath the fountain. The effect is further enhanced by eight small jets rising from the large basin, each lighted from beneath by a colored 500-watt lamp, while eight dolphins in the small basin throw streams toward the central jet.

Below the central basin is an elliptical room

ELECTRICALLY ILLUMINATED PAN-CHROMATIC FOUNTAIN IN PLAZA OF UNION RAILROAD STATION, DALLAS, TEXAS

8 by 14 feet, separated from the fountain above it by a plate-glass ceiling. In this compartment are the four big search-lights and the apparatus for operating the mechanism that changes the color screens and provides the variegation of colors. This apparatus is a motor-operated system of mechanisms, the operation of the color-changing system and of the entire system being automatic. No attention is required except in case of an emergency. Entrance to the room where the flood-lights and screens are located is effected by means of a passageway leading from a manhole in the larger basin.

While the Dallas fountain is not the first to employ colored flood-lights, it is the first to use a total of 5,000,000 candle-power in incandescent lamps, with changing color screens, for the purpose.

The designer was W. D'A. Ryan, of the Illuminating Engineering Laboratory of the General Electric Company, who planned the illumination of the Panama-Pacific Exposition, the Brazilian Centennial and other great lighting effects of the kind. The cost of the fountain was approximately $50,000. It will be operated two or three hours each night when the weather is fair. The water is pumped in such a way that it is used over and over again, hence the amount required for the running of the fountain is negligible.

Operating expenses are low; the cost of the electric current used is said to be from 60 to 90 cents per hour.

The Lighting of Speed-Limit Signs

By T. P. Brown

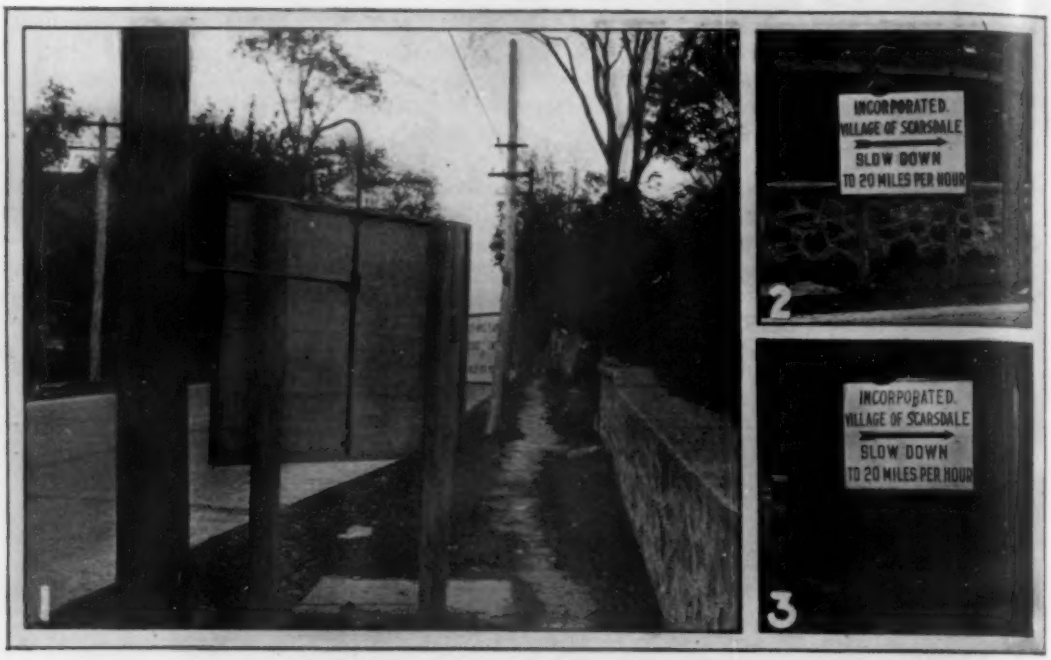
THE old saying, which is still good law, that "ignorance of the law excuses no one," is a frequent cause of discomfort and annoyance to motorists. But how is the traveler to know all the various speed limits of the towns through which he is passing? At least one state (New York) is trying to help him. In addition to an act of the Legislature which specifies what the minimum speed limit shall be, it takes into account the plight of the motorist traveling at night. To make sure that the driver shall know when he is approaching the limits of a village or city, the New York act specifies that the speed limit sign must be *"adequately illuminated between sunset and sunrise."*

Under this law "each city shall have placed conspicuously within 15 feet of the traveled portion of each main public highway where the city or village line crosses the same, or at a point within the limit of such city or village on such highway, and within 15 feet of the traveled portion of each main highway where the rate of speed changes, on posts on both sides of the highway, at a point where the speed limit is reduced, or changed, signs adequately illuminated between sunset and sunrise and of sufficient size to be easily readable by a person using the highway, the top of which shall be not more than 8 feet nor less than 6 feet from the ground, bearing in letters 6 inches high the words "City of ———" or "Incorporated Village of ———." "Slow down to —— miles" (rate being inserted) and also an arrow pointing in the direction where the speed is to be reduced or changed.

Since these signs are to be lighted only between sunset and sunrise, the thought naturally comes to mind to utilize the existing street-lighting circuits to furnish the power. The light can be turned on and off simultaneously with the street lamps, thus requiring no separate attention for maintenance and lamp renewals. Such signs may be illuminated, generally, in either of two ways—by a floodlighting projector mounted near-by on a convenient pole, and directed down so as properly to cover the sign, or by some form of reflector equipped with a lamp, mounted on the sign-board and directed so as to light the sign effectively. If a flood-light is to be used, it could be mounted on a convenient pole, directed downward and focused so as to give the proper results. A good application for the floodlighting projector is in the lighting of a sign on the far side of the road.

Illumination by Reflectors

For vertical signs, such as those with which we are dealing, the thought naturally comes to mind to use some form of angle reflector similar to the ones used in regular sign-board service. A trial installation was made at Scarsdale, N. Y., using a weather-proof elliptical angle reflector, equipped with a mogul socket, a 600-lumen Mazda C series lamp, a small transformer, and the necessary conduit, condulets and wire. The transformer was mounted on the opposite side of the road (the side carrying the series circuit). Wires were run from



SPEED-LIMIT SIGNS THAT ARE MADE EFFECTIVE
1. How the sign is installed. 2. Daytime view of sign. 3. The sign is adequately illuminated at night

this transformer across the road to the pole nearest the sign. It so happened that there was a pole within 3 feet of the sign. The wires coming down the pole were put in ¾-inch pipe, entering through a service condulet. The pipe was fastened to the pole and sign by small straps. Tests as to the visibility at night showed that there was no difficulty in picking up the wording of the sign at distances up to 200 feet. This means that a motorist would be able to slow down even from speeds as high as 60 miles an hour within the visible distance.

A factor to be borne in mind is that the high-voltage series line should not be brought down to the lamp, because of the proximity of pedestrians and the added dangers of grounds. This was obviated in the foregoing installation by the use of a series transformer in the series circuit and running the low-voltage lines to the lamp from the secondary side of the transformer.

The safety factor is taken care of by putting the wires to the lamp in an iron pipe running down the pole and over to the reflector. No unauthorized person can tamper with the circuit, since all wiring to a distance of about 20 feet from the ground is covered.

A very effective method of taking care of the needs of both signs would be to run the series leads from the transformer down to the sign on the near side of the road, run the lead across the road to the far-side sign, using a stub pole, if necessary, to obtain the clearance above the road. Where two signs only are to be lighted, it is possible to do the job nicely with a small transformer, and two angle reflectors (equipped to take the series lamp and two 600-lumen lamps).

Cooperation Between Adjoining Villages

Quite frequently it will be found that two abutting villages, by cooperation, can do much to help in the solution of the problem. If the villages can be induced to place their signs fairly close to each other (without obstructing each other's view), it will be possible for the central station to make a material saving in its installation cost.

It should be borne in mind that the resultant illumination depends very largely upon the proper location of the reflector with respect to the sign. In order to insure this, the various reflector manufacturers have published detailed data as to the method of mounting the units. The question as to the amount of light necessary to illuminate the signs properly is one that can be answered only in general terms. It has been the experience of the author that an intensity of from 5- to 10-foot candles is sufficient to give good readability, and will certainly be complying with the letter as well as with the spirit of the law.

Utilizing the Salvage Value of Old Road Surfaces

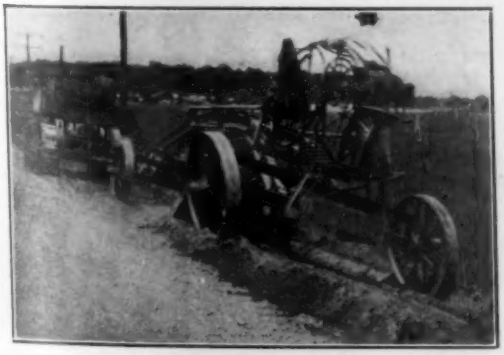
By A. H. Hinkle
Superintendent of Maintenance, State Highway Commission, Indianapolis, Ind.

IT is not the purpose of this article to advocate the salvaging of an old base by the use of some cheap top where the alignment, grade and heavy traffic would not make it economical to do so. It is the purpose, however, to describe briefly such methods as are being used with apparent success where the grade and the alignment of the old road are such as to justify retaining it in its present location.

Reclaiming Old Gravel and Stone Roads with the Same Type of Surface

The reclaiming of old gravel and stone roads built with a narrow surface to accommodate horse-drawn traffic is important where the roads have become obsolete because of increased modern traffic requiring a wider surface. Many miles of such roads are found throughout the country but have not sufficient traffic to justify the cost of building a modern hard-surfaced road.

The best available solution of the problem is to overhaul the old narrow stone or gravel roads with the same type of surface. In Indiana many roads were not only narrow as to metaled surface and road-bed, but usually had insufficient side ditches with improper drainage, as well as excess crowns, frequently from 6 to 9 inches in a width of 10 or 12 feet. Such roads were quite completely overhauled. They were given a coat of gravel or stone on their sides, extending sufficiently far out to make a surface 18 feet in width and to reduce the crown to about 3 inches. Shoulders were built up to conform with this thickness of metal on the sides, by the use of a 10-ton Caterpillar tractor drawing a 12-foot blade grader. Usually the metal on the sides was put on in two or more applications, and finally a thin coat of metal was placed over the full width of the road surface, and the shoulders and ditches were shaped to conform. This virtually converted the old, narrow, high-crowned road into a modern gravel or stone surface, 18 feet in width with about a 3-inch crown and sufficient side ditches to provide proper drainage. Because of the high crown in the old road, it was usually unnecessary to trench along the sides of the old metal in adding new metal, and by the application of several successive coats of metal, never at one time more than 3 or 4 inches in depth when measured loose, the road surface was never seriously objectionable to traffic, even though a roller was not used in compacting it. Both gravel and stone were used in building up the old road-bed. Most of the gravel in Indiana contains an excess of sand and a very small amount of large-size boulders, and this gravel was used generally without screening. When crushed limestone was used, usually about 2- or 3-inch stone was used for the bottom course, 1½-inch down being



CUTTING DITCHES AND BUILDING UP GRAVEL ROAD SHOULDERS PREPARATORY TO ADDING NEW METAL TO THE SURFACE

Economics in Road Building

The science of road building is now so developed that it is not a difficult feat to build a new good road if one is given money in abundance. The problem has largely resolved itself into one of economics, that is, the building of a road that will satisfactorily carry the traffic at the least cost to the general public—including the cost of operating vehicles on the highway as well as the cost of constructing and maintaining the road.

While the cost of a new road involves the question of economics, the proper maintenance, repair, reclaiming and salvaging of old roads involves a much more complex economic problem. The first requisite in solving this problem is to learn what means are available for salvaging old road surfaces. In this paper Mr. Hinkle describes briefly some of the available methods for utilizing the existing value of such surfaces.

STATE ROAD NO. 7 BEFORE RECLAIMING

used for a second layer. When stone was used in building up the sides, it was usually necessary to follow immediately with a finer stone because of the handicap to traffic if the coarse stone were left uncovered.

On completion of this work, we still had the same type of surface as when we started, except that it is able to carry from five to ten times as much traffic as the old surface would safely carry. This work in Indiana has cost about $3,000 a mile of initial cost, plus an annual maintenance cost of from $400 to $1,000 per mile per year, depending on the traffic and availability of material.

Tar Surface Treated Gravel Roads

The method of maintaining gravel roads smooth and dustless by the application of a light grade of tar of from 15 to 30 viscosity, has been demonstrated by many state highway departments to be beyond the experimental stage, and they are all convinced that they are following the proper course under certain conditions of finances. Preliminary to this treatment, the gravel road surface is reshaped to a proper cross-section and grade, and is maintained in that condition until compacted with only a thin layer of loose material on the surface. If the loose material on the surface consists of dirt or dust or exceedingly fine sand, the surface should be thoroughly swept until clean and free from all loose material and so as to expose the larger gravel over the entire surface. To this surface is applied about ¼-gallon of tar per square yard, or ⅓-gallon if there is much loose material on the surface. After this has penetrated into the gravel surface, a second application of tar of about ⅓-gallon is applied, which is immediately covered with coarse sand, pea gravel or fine stone chips at the rate of about 60 cubic yards per mile. The surface can then be dragged with a road planer, which will aid in smoothing it by depositing the mixture of the covering material and tar in all low places. Any places that show indications of insufficient tar after dragging should have a small additional amount of tar applied and cover material placed on it. Care should be taken not to apply too much tar in one application, as an excess will induce later waving of the surface under traffic. The purpose of this method of treatment is to secure a top layer of gravel saturated with the tar to a sufficient depth so that after it hardens it will form a crust strong enough to resist being broken by the traffic which goes over the road.

Mr. Donaghey of Wisconsin has modified the foregoing procedure slightly this last year by scraping outward with the road grader about ½-inch or more of the top surface of the gravel after applying the first coat of tar; and immediately after the second application of tar, the tar and gravel previously scraped out is scraped back onto the tarred surface, which is worked around with a drag or grader until a smooth and uniform surface results. This

STATE ROAD 7, TWO MILES EAST OF MONTICELLO, AFTER BEING RECLAIMED AS A GOOD GRAVEL ROAD

method of making a dustless surface does not increase the strength of the road crust to any great degree, and hence the desirability of having the old surface built up of a sufficient amount and kind of coarse gravel so that the foundation will not give way under the traffic which must go over the road. Any breaks in the surface during the summer may be patched with a mixture of tar and sand in the proportion of about 17 gallons of tar to 1 cubic yard of sand.

A traffic-bound macadam may be treated in much the same way as the gravel road described above. Some states are reporting a maintenance cost of $1,000 to $1,400 per mile for such types of surface, which carry a very heavy summer traffic. With this type of road it is possible to have a dustless road surface, where a heavy summer traffic demands it, many years before finances permit building a more permanent type of pavement.

TAR SURFACE TREATED GRAVEL ROAD

Salvaging Old Stone or Gravel Roads as a Base for Bituminous Macadam

Frequently in building a bituminous macadam road it is possible to take advantage of the full value of the old road metal as a base for the new top. If the old base is narrower than the proposed new top, it can be widened, where the crown of the old road is not excessive, by trenching along the sides of the old metal and constructing a water-bound macadam strip, sufficiently wide to make the required width of metal. This added width of base is usually constructed in two approximately 4-inch courses, permitting the second course to feather out on the old road surface toward the center of the road to reduce the excess crown. Where the crown in the old road is exceedingly high, say 6 to 9 inches, this height eliminates the necessity of trenching along the sides, and the base course of stone at the edge is laid directly on the old earth shoulders. Both base courses are feathered out on the old metal to properly build up the edges of the old surface and eliminate the excess crown.

In preparing the base, it is imperative to study the old road-bed, picking through the old metal and finding the weak places. These frequently can be learned from the visible failures or from a history of what has happened in past years. The weak places should always be reinforced with additional thickness of metal. It is found that while a 6-inch thickness of compacted metal may be a sufficient base on sandy and gravel soil, it may require even 10 or 12 inches on those putty clays which do not drain well. It is a very good plan to do all the heavy hauling over the old base if possible during the work, to develop the weak places in the old road, so that they may be reinforced before the top is placed. In all this base work the coarsest size of crushed stone consistent with the thickness of the layer to be placed should be used, as it is found that the coarse stone makes a stronger base than the finely crushed product. The only exception to this is that when placing stone directly on clay it is best to use first a 2-inch or 3-inch layer of crusher-run or fine stone to prevent the soft clay from being forced up into the coarse stone when rolling it. Care should be taken to roll this coarse stone thoroughly. A minimum amount of screenings should be used with an abundance of rolling to produce a solid, compact surface. Outside of too thin a base course, nothing weakens a strong base more than too much fine stone and dust.

SPREADING STONE BY HAND, AIDED BY TEMPLATE, WHICH IS SLID ALONG ON TOP OF THE SIDE FORMS

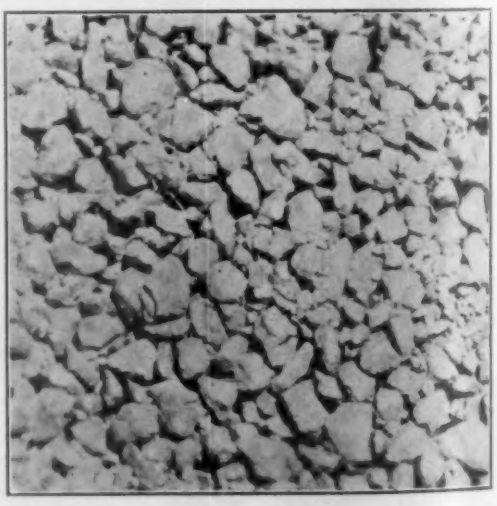
On top of this base a 3-inch bituminous macadam top, using either tar or asphalt, is built. Most of the work in building the top course is done according to standard practice with a few variations. The specifications state that the coarse aggregate should pass through a 4-inch circular opening and that no more than 30 per cent should go through a 2-inch circular opening, 8 per cent through a 1½-inch opening, and 2 per cent through a 1-inch opening. Much of the stone used in the past, however, had less fine material in it than the specifications would permit. The asphalt or tar was applied in three coats instead of two, as it is found that this usually produces a much better completed job than two-coat work. An excess, particularly of asphalt, is very objectionable, besides adding unnecessarily to the cost of the work. Another important feature of the work is to guard against applying too many screenings after each coat of asphalt. The object sought is to hammer the coarse stone as closely together as possible with the roller and yet not entirely close the voids by crushing the stone, but to permit a thin film of tar or asphalt around all the larger stones in the layer and to produce a finished surface with the three coats of bituminous material and screening that will just close up all the voids and leave such a thin film of tar or asphalt on the surface of the stone that the imprint of the large stones will show in the surface. While the amount of tar or asphalt required to produce the proper condition will vary with the nature of the stone, it has been found that with a depth of 4 inches of stone, measured loose, the first two coats, if of asphalt, should usually not exceed 2¼ gallons per square yard, and, if of tar, should not exceed 2½ gallons. The third coat, either of tar or of asphalt, should be about 3/10-gallon per square yard.

The first two coats of asphalt used have a penetration of from 85 to 100, and it is believed that any softer material than this is not suitable for modern heavy traffic. The third coat of asphalt has a penetration of 250 to 350. The first two coats of tar used show a float test of 140 to 190, and the third coat of tar has a viscosity of 35 to 40. When the latter grade of tar is used in the third coat, the surface is dragged with a heavy road-drag or planer after the covering material is applied, thus removing any irregularities in the surface, much in the same manner as a gravel road is smoothed by dragging. The third coat of tar stiffens sufficiently after a day or two to hold the tar-coated stone chips in position, which leaves a permanent leveling of the surface.

Since this type of road has to be built right out in the field and it is extremely necessary to vary the quantity of tar and asphalt, the amount of covering material and the rolling to fit the particular size and quality of stone that is used, it is difficult to describe definitely and briefly how the work is properly done.

Old Gravel Road Surface Treated with Tar and Topped with Asphaltic Concrete

A number of miles of this type of work have been built by the Michigan State Highway Department. A gravel road is chosen that is sufficiently strong to carry traffic, one that is well built of good width and with a satisfactory cross-section and ample drainage. The road



SURFACE AFTER FIRST APPLICATION OF BITUMINOUS MATERIAL, WITH PARTIAL COVERING AND ROLLING

surface is put in good condition through maintenance, and the surface is then given approximately ¼-gallon per square yard of refined tar, which gives considerable penetration, and the gravel is held intact so that it will not pick up and become mixed in with the hot asphalt top when it is raked.

The minimum thickness of the gravel base should be 6 inches, preferably 8 or 9 inches. A power grader is used to give the gravel surface a final shape, which, of course, parallels the surface of the finished roadway. A template is used to see that the proper cross-section is obtained. The surface is then swept clean, loose material being pushed out to the shoulder of the road, and the refined tar is applied. A sufficient time is given to allow the light oil to evaporate from the tar before starting to lay the black base. Surfacing is started at a point near the plant, going back about one mile, completing it, and hauling over it to the next mile, and continuing in the same manner until the job is finished. By so doing, the trucks do not break up the gravel surface as they would if the job were started at the point farthest from the point and built toward it. The roadway is leveled up with a black base that is of somewhat finer aggregate than that specified by the Asphalt Association and that carries about 6½ per cent bitumen. Black base is used only to fill in depressions and to bring the treated gravel surface to a proper cross-section. All gravel that is not firmly consolidated is dug out and filled in with the black base materials. Particular attention is paid to the edges. Truck drivers are instructed to drive close to the edge to find any weak places that may exist.

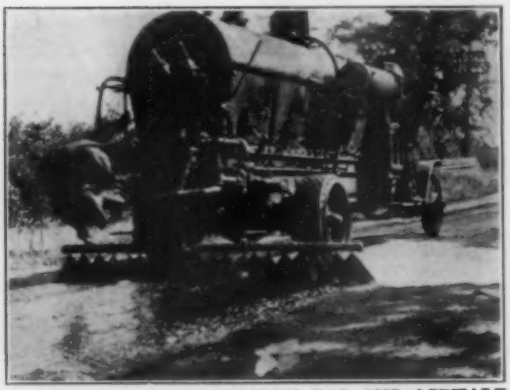
After this operation, pieces of 2 x 6-inch timbers, 16 feet long, are spiked along the curb line with iron pins. The surface coat is then placed, consisting of an asphaltic concrete carrying 9½ per cent bitumen, 14 per cent dust, 21 per cent ½-inch crushed limestone of good quality, and 56 per cent sand graded closely after Richardson's heavy-traffic mix. Particular attention is paid to the sand grading, one man being employed at the plant testing sand, and one taking temperatures. The wearing surface averages from 2 to 2½ inches in thickness after a thorough rolling. Three power-rollers and one 1,500-pound hand-roller are used. A 5-ton power-roller surfaces with a straight roll, and immediately behind this roller a hand-roller is used for cross-rolling. A 5-ton roller then makes a double diagonal roll, followed by an 8-ton roller which also rolls diagonally, taking out the stop marks of the 5-ton roller when surfacing with a straight roll. After rolling diagonally, the 8-ton roller straight-rolls the entire surface and is followed by a 12-ton roller with a slow straight roll. The cost of recent work of this type is reported at about $15,000 per mile for an 18-foot surface.

Resurfacing Old Macadam Roads with Bituminous Concrete or Rock Asphalt

The use of an old macadam road as the base course for some type of bituminous concrete is such standard practice in many places that it hardly needs any special description. The old base should be sufficiently strong to carry the heavy traffic that will come upon the completed road. This base course of stone should be, when compacted, not less than 6 inches on sandy, gravelly, well-drained soils, and not less than 10 to 14 inches on clay soils which saturate badly. Perhaps the best test of strength of base required is that it should be such that it will show practically no signs of failure under the heavy trucking which is supposed to be carried over the finished surface. The 2-inch bituminous concrete top course will not add much to the strength of the base, and if the old base will safely carry the load, the small additional strength provided by the top will add a small factor of safety, which is justified in any road surface. Where a binder course is used, greater additional strength is added to the base than by the same depth of top course. It will almost always be necessary in utilizing such an old road base to add material in places, and frequently a water-bound course should be built over the old road surface. It may also be necessary to widen the old base, in which

SWEEPING THE SURFACE PREPARATORY TO APPLYING THE THIRD COAT OF BITUMINOUS MATERIAL

A sweeper attachment to a Fordson tractor does this work very economically



METHOD USED IN APPLYING TAR AND ASPHALT

work care should be taken to secure the required thickness of stone at the edges of the foundation. The base course should always be wider than the contemplated top course.

In adding new stone to the old base, it is very desirable that comparatively coarse stone be used in the work and that it be well rolled and only a minmum amount of the screenings and dust used to fill the voids. Such macadam base work should be done sufficiently long before the top is placed to allow it to set up and become hard. It may be desirable to permit traffic over the base for some time, as nothing will show up the defects of the base any quicker than traffic. Before the bituminous top is placed upon an old macadam base, its surface should be thoroughly swept and cleaned so that the large stones are exposed and a rough, jagged surface exists. Too frequently these bituminous tops are placed on an old macadam with a film or mat of limestone dust upon the old surface. When this layer of dust becomes saturated with water, it produces a condition which will invariably cause the waving and failure of the surface under heavy traffic.

The use of a standard hot-mix top or rock asphalt top on such a base is so common that it need not be described. It is believed, however, that with the use of the hot-mix top, particularly the sheet-asphalt mix, a binder course should be constructed in all cases. This course can be used to take out any little irregularities, which are liable to be found in the old macadam base.

With rock asphalt good results are being secured in the use of a completed course 1¾ to 2 inches in thickness. When a rock asphalt top is to be placed, it is desirable to leave the top voids in the coarse stone unfilled. When this is done, however, it is extremely desirable that enough screenings be gradually applied and rolled and watering done and enough time given to thoroughly set the coarse stone, even though the top voids are unfilled.

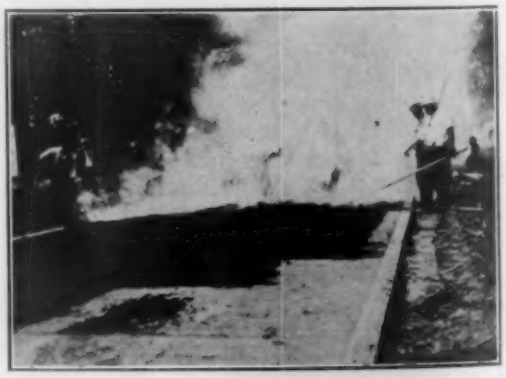
Resurfacing Old Macadam Roads with Brick

The use of old macadam roads as a foundation for new brick surfaces is standard practice in states where brick is used extensively. It is frequently desirable on steep grades to construct some other type of surface than a bituminous top, because of its slipperiness. Hence, where because of economy it is desired to resurface an old macadam road with a bituminous top and yet this kind of surface is undesirable, it may be economical to use bricks. In such cases the old macadam road can be salvaged and practically the full advantage of it taken as a base for the new brick top.

Resurfacing Old Brick or Concrete Road with New Concrete Slab

An old brick or concrete road which is disintegrated and worn can be used as a foundation for a new concrete slab. Such a base will permit the use of a thinner slab in the new construction than when the new slab is laid on the ordinary soil.

An example of this type of construction was made by the Indiana State Highway Commission on the National Road between West Terre Haute and Terre Haute during the summer of 1923. The old brick road had supposedly been built on a concrete base some years before. The base had evidently been made of a very defective concrete, and this, together perhaps with poor brick in places, combined with the enormous heavy freight traffic over this road, had pounded the brick surface to pieces in many places. The holes and depressions in the old brick had been patched with a mixture of tar and stone for a couple of years in the ordinary process of maintaining the surface. The surface, however, was breaking up so badly that it was



PLACING ASPHALTIC CONCRETE SURFACE ON A MICHIGAN HIGHWAY

deemed desirable to put on an entire new top, which it was agreed in this case should be a new concrete slab. The old tar patches in the surface were left intact and a few large and deep holes which had developed since any tar patching had been done were filled with a lean mixture of concrete. Upon this old patched brick as a base was constructed a concrete slab with a minimum thickness of 5 inches. The concrete was reinforced in both directions with ½-inch square deformed bars spaced 3 feet 4 inches on centers. The pavement was 28 feet wide and one side of the new slab was constructed at a time, while traffic was permitted to use the other side of the pavement. This work cost about $2.35 per square yard. Although this cost is almost as much as new pavements are now costing, it was high because of the small job and of the necessity of keeping half the road open to traffic while the other half was being built, and because labor conditions were quite acute at the time the work was done. Certainly, the use of the old brick pavement as a foundation for the new slab has provided a base far stronger for carrying heavy trucking than the average concrete slab that is placed on our rural highways on the virgin soil.

CUTTING AWAY THE OLD CONCRETE WITH PAVING BREAKER OPERATED BY PORTABLE OUTFIT, WHICH CAN BE EASILY TRANSPORTED FROM ONE SMALL PATCH TO ANOTHER

Resurfacing Old Brick Roads with Asphalt Mix

Sheet Asphalt.—The use of old brick roads as a base for sheet asphalt is such standard practice in many of our cities that it will not be described in detail. Columbus, Ohio, might be mentioned as a city having done successfully a large amount of this class of work. Many other large cities have done this class of work, and all indications are that such a base usually is equal or superior to the average new base that is built. The elevation of street-car tracks in the center of the street and the height of curbs sometimes limit the use of such types of construction. Frequently, however, the asphaltic surface can be feathered out along the tracks and sometimes it is desirable to raise the rails for additional foundations. Also, frequently the gutter is sufficiently deep to permit reducing its depth by 2 inches or more. It is not bad practice in building new pavements to make a curb of sufficient height to permit of this type of resurfacing when needed in the future.

HAND AND POWER ROLLERS USED ON ASPHALTIC CONCRETE SURFACE IN MICHIGAN

Rock asphalt has also been used in the resurfacing of old brick roads with satisfactory results.

Emulsified asphalt mix has been used in resurfacing old brick roads in Princeton and Franklin, Ind., with apparently good results. Where the old brick were shattered and badly broken, they were taken out and replaced with cement concrete mixed in proportions of 1:2½:5. Small depressions in the brick surface where the bricks are solid and will serve as a rigid base are patched with a binder course made with emulsified asphalt. By the use of the concrete patches and binder patches, the old base is made to conform very closely to the desired cross-section of the finished pavement. The old surface is then painted with the emulsified asphalt at the rate of about ⅛-gallon per square yard. The emulsified asphalt mix has the advantage in that it does not have to be heated in making

FINISHING A CONCRETE PATCH
Great care must be exercised on this part of the work to secure a small riding surface

the mixture and hence for small jobs can usually be done at less cost than the hot mix. It also apparently has an advantage in that it will stay put when only a thin course has been used. On Thirty-Eighth Street Boulevard in Indianapolis an old asphaltic concrete pavement had become hard and dry and was cracking to a point where it was beginning to disintegrate. A short stretch of this pavement was resurfaced in 1922 with about half an inch of emulsified asphalt mix after the cracks and disintegrated places had been patched and the old surface painted with ⅛-gallon of emulsified asphalt per square yard. This resurfacing has now been down two years and has the appearance of a new first-class asphalt surface, even though only ½-inch thick.

Patching Old Concrete Roads with Quick-Hardening Concrete

Where old concrete road surfaces have failed because of base failures, it has been the custom generally in the past to patch such places with a bituminous mixture, because of the time required for concrete to harden.

Because of the availability of the old concrete road as a foundation for a new surface of some type, it is desirable, where base failures have occurred, to patch the old road with portland cement concrete in order to make it as stable as the remainder of the surface. Such concrete patches may also reclaim the old surface without a resurfacing.

It has been demonstrated that concrete patches can be made by a proper mixture of concrete made of portland cement and that the road can be opened to traffic in two, five, seven or more days, depending upon the concrete mixture used. This quick-hardening concrete made of the ordinary portland cement depends for its quick strength on (1) richness of the mix; (2) coarse and properly graded sand; (3) freedom from excess water; (4) use of calcium chloride; (5) high atmospheric temperatures. Concrete patches have been made this year that were opened to heavy truck traffic two days after they were made and that show no signs of being injured.

While the new high alumina cement can be used to make a patch that can be opened to traffic one day after being laid, the cost of this cement at the present time is such as to make these patches more costly than when made with the quick-hardening concrete made of ordinary portland cement, as described above.

ACKNOWLEDGMENT.—From a paper read before the American Road Builders' Association, at Chicago, January, 1925.

Fires in Public and Semi-Public Buildings

THE majesty of the law keeps the criminal behind steel bars; compulsory-education laws hold pupils within school buildings part of the day; the sick in body seek hospitals and cannot escape; the sick in mind are confined in asylums and know not how to escape . . . For the time being, school children and the insane and feeble-minded are as much in the keeping of the state as are prisoners; yet, it is a strange commentary on our angle of vision that jails and prisons, on the whole, offer greater safety to life than do school buildings and asylums. We would have not less safety in prisons, but at least equal safety in school buildings, asylums, and all other places of detention accommodation and public assemblage.

In 1924, there were 599 fires in public and semi-public buildings, with a damage of not less than $10,000 each, as follows: 178 schools, 95 churches, 26 hospitals, 211 hotels, 59 theaters and 30 courthouses, jails and city halls.

The loss of life in these fires, the matter of first consideration, was considerable and needless. The two outstanding sad cases were the destruction of Hope Development School for subnormal girls, at Playa Del Rey, Calif., in which fire twenty-three of the forty-one girls at the school lost their lives, and the Christmas tree fire in a one-story, frame schoolhouse, at Babb's Switch, near Hobart, Okla., which demanded thirty-seven victims. In this building, the one outside door swung inward and the windows were barred with heavy wire mesh. In the California case, the investigator reported "nothing unusual, just the thing that is expected to happen where people are housed in numbers in that type of building."

—From a recent statement issued by the Industrial Commission of Wisconsin.

THE EAST CLEVELAND POOL, SHOWING LIGHTING SYSTEM

East Cleveland's Municipal Swimming Pool

By Edward C. Moore
Life-Guard

CITIZENS of East Cleveland, Ohio, are justly proud of the fact that their city now owns and operates one of the finest out-of-door swimming pools in the Middle West. Formerly the city operated a much smaller pool (70 x 90 feet) without a refiltration system, the only method of purifying the water being by means of chlorination. Without a refiltration system, the only way of providing fresh, clean water was by the ordinary "let in and let out" system. The old pool proved to be unsanitary and expensive to operate.

Refiltration and Chlorinating System

The new swimming pool, although much larger than the former (or 90 x 120 feet), and with a capacity to hold 600 bathers at one time, instead of the 300 in the old pool, is remarkably sanitary. Its refiltration system and filters turn over approximately half a million gallons of water every twelve hours. The refiltered water is pure enough to drink. In spite of the size of the new pool, the cost of operation is less than that of the old pool. Furthermore, the staff of employees has been increased only by the addition of two extra life-guards.

The refiltration system has proved so simple in operation that any one of the employees at the swimming pool can readily learn its manipulation. Equalized suction is provided by four equidistant drains, running directly across near the center of the pool. The deepest part of the pool, where these four drains are located, is 25 feet wide and from 8 to 9 feet deep. From the entrance side of the pool there is a gradual downward trend of depth from 1½ to 4 feet. At the latter point a rope is extended across the pool, attached to three iron posts. The distance from the 1½-foot depth of water to the 4-foot depth is 45 feet, providing a large space for those who are learning to swim. Then there is a more abrupt drop downward, the base of the pool slanting to 9 feet, from which point there is a gradual trend until the farthest side of the pool has been reached, where there is an 8-foot depth.

The water flows continually into the four drains and thence through a main line pipe, by gravity, the pipe drain being underneath the

pool bottom itself and leading into the pit of the filter house, which stands on one side of the pool. Here the water is pumped by a 7½-horse-power electric motor up into and through three huge 96-inch filters, each filter containing beds of sand, gravel and rock. Just before the circulating water enters the first filter, alum and soda are injected into it. A check-valve in the main-line pipe causes a back-flow of the water, which runs down small pipes into an alum tank and into one filled with soda, and then back again into the main-line pipe through other small pipes. The alum solution, forming a gelatinous substance, helps to sift the dirt in the pool water as it strikes the filter beds of sand, gravel and rock. Finally, as the sifted pool water leaves the bottom of the filters before flowing back into the pool, it is subjected to a chlorine treatment from a chlorinating machine attached to the return main-line pipe. As the filtered and chlorinated water returns to the pool, it enters a pipe line which completely girdles the pool. Ten cement stanchions, 2 feet above the surface of the pool water and situated around the sides of the pool, make fountains out of which the filtered water returns to the pool in sprays. Thus the pool water, as it passes through the purification process, is first filtered, then chlorinated, and finally aerated.

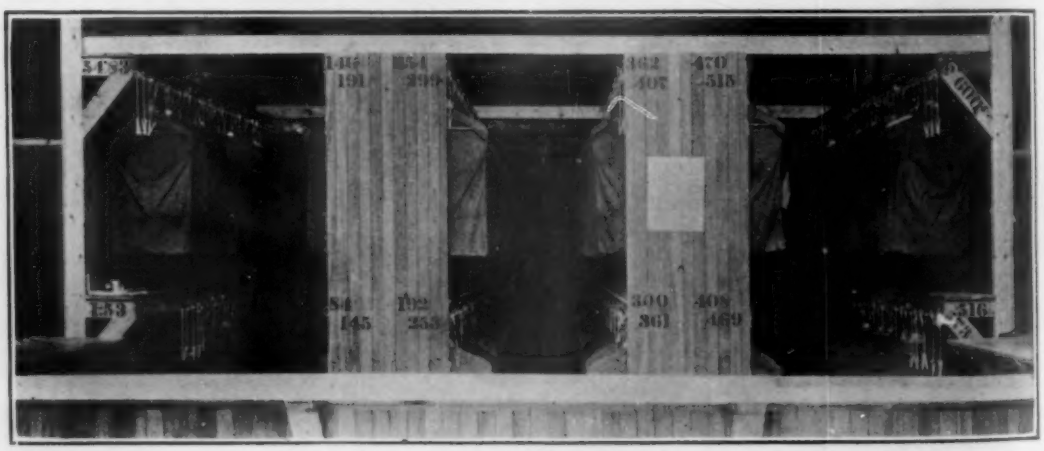
The efficiency of the filtration system is indicated by the fact that, whereas the water in the city reservoir itself which supplies the swimming pool is not clear enough so that the bottom of the reservoir can be seen, and whereas at the reservoir chlorination is the only artificial agency of purification, at the swimming pool the very water from the city reservoir is made purer as it flows into the swimming pool than the water which East Cleveland citizens drink. The fact that there are no spore formations, growths or slime on the sides or parts of the swimming pool, indicates how effectively the three agencies of purification — filtration, chlorination, and aeration—kill the micro-organisms in the water.

Fence and Scum Gutter

The new swimming pool has many attractive features. Extending from the bath-houses at the entrance side of the pool, is a high, galvanized-after-weaving, chain-link fence which encloses the remaining three sides of the pool. This fence affords ample opportunity for outside spectators to see what is going on in the pool. Surrounding the pool is a seven-foot cement walk provided with drains. The cement walls of the pool project 2 inches above the inner edge of the cement walk, preventing any waste of water which might otherwise splash over on the sidewalk. A scum gutter, constructed so that its edge projects out farther than the top inner edge of the pool wall, catches dirt on the surface of the water, and drippings from bathers standing or sitting on the inner edge of the pool wall, and also acts as a hand support for the swimmers.

The Children's Special Pool

Among other features of the East Cleveland swimming pool, a special pool for children deserves mention. This small pool lies within the large pool. It forms a square of shallow water at one corner of the greater pool. Two sides of the children's pool are formed by the outer cement walls, and the other two sides are cement walls constructed within the pool itself. Three of these walls are surmounted by a chain-link fence. One of the



CHECK-ROOM WITH COUNTER IN FRONT, BETWEEN THE MEN'S AND THE WOMEN'S DRESSING-ROOMS AT THE EAST CLEVELAND POOL

cement stanchions or fountains throws a continual spray of re-filtered water into the children's pool. Three outlets in one of the enclosing cement walls allow the water to flow toward the drains in the larger pool.

CHILDREN'S SECTION OF THE EAST CLEVELAND POOL

Bath-Houses and Checking System

The bath-houses of the new swimming pool are situated underneath the cement bleachers that form one side of the Shaw football stadium, located in the same sports field. There are 48 dressing-rooms for men and 26 for women. Toilets and shower-baths are included. The check-room with counter in front stands between the men's and the women's dressing-rooms. The checking system provides coat hangers, over which are hung large, square canvas bags. The bags may be slipped off the hangers. Inside each bag is room for underclothing, and pockets on the sides furnish space for smaller articles of clothing. By hanging outer wearing apparel, such as coat and trousers, upon the clothes hanger, and then encasing this with the canvas bag, a neat, non-bulky, water-proof parcel is made. This is then hung by the attendant upon a hook in the check-room and numbered the same as the hanger, and the customer is given a rental tag stamped with the same number as that of the hook and hanger.

Lighting System

One other item which may be of interest to the reader is the lighting system. Three electric wires run from the top of the cement bleachers, which are above the bath-houses, to the tips of three telephone poles arranged about 30 feet apart, outside the fence on the farthest side of the pool. Nine 750-watt electric lights, suspended 28 feet in the air above the pool, furnish light enough so that the bottom of the pool, even at the 9-foot depth, may be easily seen at night. In the filter house, there are four 75-watt lamps, and the bath-houses contain forty-seven 75-watt lamps and twenty-two 100-watt lamps.

Equipment Used

The East Cleveland municipal swimming pool was designed by John A. Cowing, building inspector and construction engineer, of East Cleveland, Ohio, after a careful study of swimming pool data from other cities. The construction of the pool was handled by the engineering department of the city, without outside help, at a total cost of $49,000. The principal equipment used consisted of a Le-Courtenay pump for turning the water; filters manufactured by the International Filter Company; tanks supplied by the Kewanee Boiler Company; and chlorinating apparatus of the Wallace & Tiernan type. Crescent portland cement and Medusa White portland cement were used in building the pool, and the chain-link fence was purchased from the Anchor Post Iron Works.

Mr. Cowing will be happy to correspond with any one desiring further information regarding the construction or operation of the East Cleveland swimming pool.

An Investigation of Refuse Collection Costs

WHEREVER garbage and refuse are collected, a large proportion of the expense can be attributed to the length of time required by the collecting vehicle in going to and returning from the dumping-ground or disposal plant. If the distance is long and the vehicle is horse-drawn, the expense is prohibitive. To correct this condition, there has been developed a scheme of tractor-trailer collection which has cut costs tremendously where it has been tried out. In Chicago, where an extensive test has been carried on resulting in the decision to adopt the trailer scheme completely, it is estimated that a saving of $717,503, or 22 per cent, will result. In that city hauls of two miles are showing a saving, and unfavorable dump conditions have been overcome by the use of crawler-type tractors.

In Milwaukee, the tractor trailer system improved service saved the city over $300,000 and has materially reduced the personnel In that city trailers have been found efficient on hauls as short as one mile, and dump conditions have been met by the use of heavy-duty chain-driven tractor trucks. Rochester, N. Y., is about to launch the trailer plan in one section of the city, and the difficulty of financing is being solved by a favorable rent payment plan with a guarantee of 15 per cent saving. —From *The Newarker*, Newark, N. J.

Some Legal Aspects of Sewer Improvements

By A. L. H. Street

AN inquiry raises these questions: (1) May a sewer be laid across private property by a municipality, where the improvement will benefit that property and, perhaps, one or two other tracts, but can be used for no other purpose? (2) Is the right of the municipality in this regard affected by the fact that there is already a sewer in the street abutting upon the first-mentioned property, in view of the fact that, even if connection were made with it, it would serve second and third floors and for toilet and other sanitary purposes only? (3) If the owners of the property should refuse to grant a right of way at a nominal figure, would the authorities have a right to assess benefits and damages exclusive of the "benefits that would be assessed to cover the sinking fund and interest on the extension"?

1. It may well be doubted that a municipality may establish an independent sewer for the benefit of but two or three lots or small tracts of property, excepting as there may be some material benefit to the public. But the right to extend an existing sewer under reasonable conditions appears to be equally clear. And the municipality, acting reasonably, may provide for sewerage in one part of town without making similar provision for other parts. (28 Cyc. 950.) The right to extend sewers as needs require was recognized in the case of Kuick vs. City of Grand Rapids, 166 Northwestern Reporter, 979, decided by the Michigan Supreme Court. Effectual disposal of sewage in the interest of the public health, rather than area of an assessment district created, is the main consideration. (Sasse vs. Barkwell, 195 Southwestern Reporter, 542, decided by the Kansas City Court of Appeals.)

2. Existence of another sewer is not a bar to a new one, especially when the existing one is inadequate. The following extract from an opinion of the Wyoming Supreme Court seems to present an accurate summary of what the courts generally hold (McGarvey vs. Swan, 96 Pacific Reporter, 708):

"It is very clear that the mere fact that a corner lot has once had an assessment imposed upon it for the construction of a sewer in front of it, along one of the streets upon which it abuts, does not necessarily furnish a constitutional reason why it may not be subsequently assessed for the construction of a sewer along and through another street upon which it abuts. Indeed, it is generally held that the existence of a sewer, of either private or public construction, is no defense against an assessment for the construction of a new sewer; for it has been deemed evident that, although the property may not need the new sewer for present drainage purposes, it may, nevertheless, be enhanced in value thereby, and so receive a benefit in addition to that derived from the former sewer. Proper sewerage facilities in a city is of such sanitary importance that the construction of a sewer has a well-known tendency to enhance the value of all the contiguous or adjacent lots in the neighborhood of its construction, regardless of any present necessity of any particular tract for sewer connections. . . . It may be that the benefit will not be as great as that which is received by other property having no previous sewer facilities, but that it may be benefited is a generally accepted theory. In other words, the benefit in such case is not dependent altogether upon a necessity for present drainage or sewer connections. . . .

"In Michener v. Philadelphia 118 Pa. 535, 12 Atl. 174, it was held that the fact that a property owner had been assessed with, and paid his part of the cost of, sewers previously constructed, and which, as alleged by him, were fully adequate, is no defense to the claim for the cost of another sewer, constructed under a municipal ordinance. . . .

"Where an assessing board, upon a consideration of benefits, adopted an arbitrary rule, by which one piece of land already sufficiently drained by a sewer had the same burden imposed upon it by the assessment for a new sewer as other lots not already drained, it was held that the assessment was unreasonable."

Although the courts usually will not supervise the judgment of municipal authorities in determining the nature of improvements to be constructed, where there is no showing of abuse of power by such authorities, nevertheless where there is a manifestly unreasonable exercise of discretion the courts will grant relief to a complaining property owner. For example, it was said in the case of the West Liberty Avenue Sewer, 54 Pennsylvania Superior Court Reports, 248:

"A property owner cannot be assessed with the cost of a 15-inch main sewer where it appears that a 10-inch local sewer would have been sufficient to give the property all of the benefit it derived from the main sewer."

In the case of Snydacker vs. West Hammond, 225 Illinois Reports, 154, the Illinois Supreme Court held that including in a drain-

age district lots not on the line of the proposed sewer and assessing such lots a small amount as benefits for the privilege of draining into the sewer in the future, does not preclude the inclusion of such lots in another district and the assessing of them for the construction of a sewer to connect with the one previously constructed.

However, in the comparatively recent case of City of Cincinnati vs. Doerger, 120 Northeastern Reporter, 304, the Ohio Supreme Court decided that where lands were adequately provided for by a street sewer with drainage, the owner was not liable to assessment for the construction of another sewer.

3. There is no legitimate relationship, legal or otherwise, between a property owner's refusal to grant a right of way across his land and the amount of benefits to be assessed. The sewer will be of the same benefit to his property whether he donates a right of way or is awarded damages in a condemnation proceeding. If conferred by statute or charter, the municipality has power to condemn a right of way, and it is abhorrent to every sense of justice that any sort of punishment be meted out to a property owner because of exercise of his right to refuse to grant a right of way for a nominal or any other consideration, and particularly when the punishment takes the form of an attempt to levy a greater assessment of benefits against his property.

In this connection, it is interesting to note that the municipal power of eminent domain cannot be bartered away. A city cannot bind itself by contract or otherwise not to exercise this power in a proper case, in respect to certain property or in a particular manner. (4 McQuillin on Municipal Corporations, sec. 1457, citing Lewis on Eminent Domain, 3rd. Ed., sec. 406).

Cities do not possess inherent power to condemn property for sewer purposes. The authority must be conferred by constitution, statute, or charter. But "the condemnation of property for public sewers and drains, or works for the disposition of sewerage, is so manifestly for public use that it has been seldom questioned and never denied." (4 McQuillin on Municipal Corporations, sec. 1490).

The two decisions cited below are interesting on the question of implied power to condemn land for sewer purposes. In the case of Allen vs. Jones, 47 Indiana Reports, 441, the Indiana Supreme Court said:

"The forty-third subdivision gives powers to the council, by ordinance, to construct and regulate sewers . . ., and provide for payment of the cost of constructing the same. This language does not seem to us to confer the power [of eminent domain] claimed. The cost of constructing a sewer is clearly a different thing from the acquisition of the right to construct the sewer through the lands of a private individual. . . . It cannot be successfully claimed that the power to condemn lands of private persons is necessarily implied in the grant of power to enforce ordinances to construct sewers. That power may exist and be exercised in the construction of sewers along the streets and alleys of the city, or, when the right can be secured by contract, on the lands of private persons."

In Illinois cases, it seems that an inference of legislative grant of power to condemn land for sewer outlets rested on certain express grants of power to condemn in connection with sewer improvements. In City of Rockford vs. Mower, 259 Illinois Reports, 604, 607, the Illinois Supreme Court said, in making its summary of the case:

"While the Local Improvement Act of 1897 does not, by express reference to land lying outside the limits of a city, contain any provision for the condemnation of the same, we have held, under a similar statute, that in the absence of such provision the power to condemn such land for the purpose of securing a suitable outlet for sewers within a city was necessarily implied."

Wheeling Chamber of Commerce Saves Park for People

THE tragedy of a needed recreation space swallowed up by development has been averted in Wheeling by the prompt action of the Chamber of Commerce, whose Christmas present to the city was a tract of 106 acres, located well within what is now Greater Wheeling. This tract had been owned and operated by street-car companies as a commercial park. For years it had served as a recreation spot for Wheeling people. But a real estate firm had purchased it and was getting ready to cut it into building lots.

The Chamber of Commerce got busy. It launched in December a campaign to raise $350,000, raised the full amount by Christmas Eve, and bought the park. The park features and the large swimming pool on the tract will be maintained and a municipal golf course and several tennis courts added.

Not only conservation of play space already available, but reservation of play space in new real estate developments is advocated by progressive cities. One of the twenty-one "fundamentals of community recreation" as drawn up by the Playground and Recreation Association of America and signed by more than 4,000 leaders in American life reads: "In new real estate developments, not less than one-tenth of the space should be set aside to be used for play, just as part of the land is set aside for streets." The Association is studying developments using this plan.

A PART OF THE PERMANENT INDUSTRIAL EXHIBIT OF MIDDLETOWN, OHIO, IN THE BASEMENT OF THE HOTEL MANCHESTER

A Community Exhibit That Works 365 Days a Year

By Frank H. Fraysur

TWO years ago, if you had asked a resident of Middletown, Ohio, "What do you know about the contribution your city is making toward the general progress of civilization?" that resident in all probability would have thought for a long, long time—and then would have found difficulty in giving a sound answer.

To-day the percentage of citizens unable to answer this question intelligently is considerably lower; for civic leaders of Middletown discovered a means of overcoming this ignorance on the part of their townspeople and of bringing out the city's distinctions, when they arranged a large temporary industrial exhibit for the benefit of delegates attending a convention of industrial editors in 1923.

After this exhibit had been thrown open to the public, it was evident that it revealed things about the city, of which the residents themselves were quite unaware. With the realization of this, the civic leaders at once began plans to establish a permanent "show window" for the purpose of displaying the wealth of economic goods which Middletown produced for the world.

Most cities pay too little attention to those essential things which flow through the productive and industrial veins of the city; too many cities take them for granted. But Middletown's exhibit lifted the roofs off the city's plants and allowed both the stranger and the uninitiated resident to witness the unsung things which composed the industrial heart of the city. It was like showing poor people that a rich gold mine lay beneath the very ground on which they had built their homes and lived for years.

One paper manufacturer showed attractively that the 3,030 miles of tissue paper made in his mill every 24 hours would reach from Middletown to San Francisco. It was shown that this paper was used in making artificial flowers, kites, fireworks, napkins, twine and "fiber" rugs. It was learned that hundreds of the most extensively advertised products were wrapped in paper and containers made from Middletown-made paper. Middletonians thrilled to find out that many of the magazines they read were printed on the product of their local mills.

The exhibit was not confined to paper: there was steel used in the manufacture of kitchen ranges in the homes of many residents which was made in Middletown; there were bicycles, medicine cabinets, electric switches,

tobacco. And then, as a community touch, a section of the exhibit was devoted to the display of handiwork of the Boy Scouts, the Girl Scouts and the Recreation Association. All were arranged with a tastefulness that set off artistically the informative value testified in the displays.

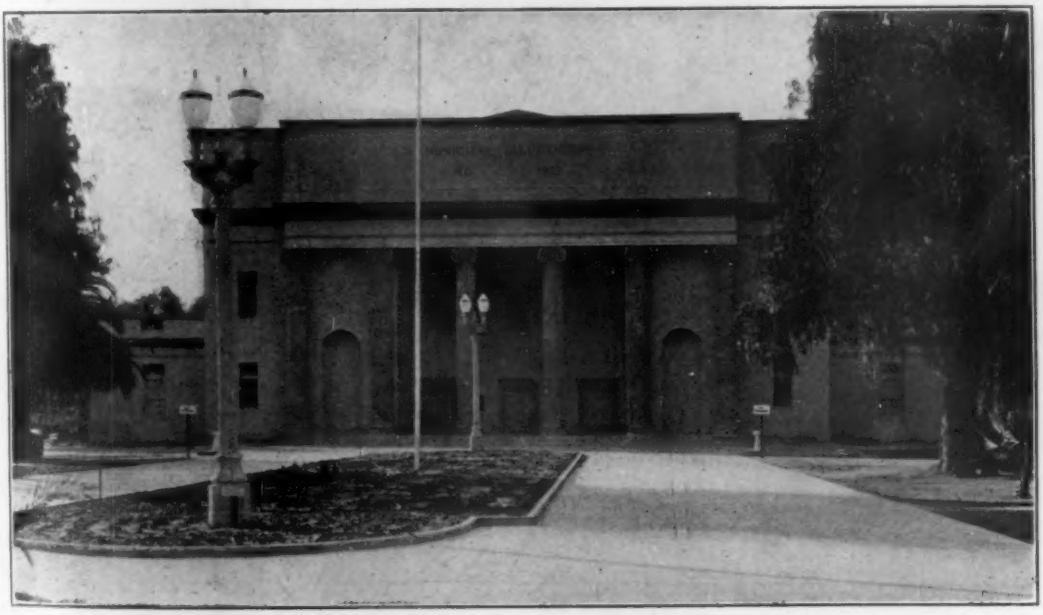
All these things were shown during the temporary exhibit, which is no unusual thing. But upon the wings of the temporary exhibit there came thought of a permanent one—here was the unusual thing. The consensus of opinion was that, considering the exhibit's educational value to the residents and the advertising value to visitors, it would be economic to establish the exhibit in permanent quarters. Then, each traveler who came through the city could, in a conveniently limited time, learn the full import of what Middletown people have to boast of.

With the hotel basement secured permanently, the individual exhibitors agreed to pay for uniform wooden booths, with glass cases, and to place their exhibits in these. Even more elaborate exhibits were arranged, and the entire display firmly established. A permanent placard on an easel was placed at the upstairs entrance to the basement, so that hotel guests might be guided to the exhibit.

Any traveling man to-day will tell you that there are few cities that impress him. He recalls most of them as necessary stop-overs—just ordinary places with streets and stores, and maybe trees and the blue sky above. But every visitor is a potential booster for a city; all that need be done is to impress him with something he can boost—and boosts are advertisements of a useful sort. Middletown has discovered a means of advertising itself 365 days a year.

Municipal Auditorium of the City of San Bernardino

RECENTLY completed at a cost of over $250,000, this building stands as an expression of the community spirit of San Bernardino, Calif. The auditorium seats 3,000 people and is equipped with a large, modern stage. The building is used for many purposes. Municipal plays, concerts, general meetings, school activities, fraternal activities, conventions and many other meetings are held in it. The charge for these meetings is nominal—simply enough to meet a portion of the expense. Most of the overhead charge is absorbed by the city. The site of the auditorium is in Pioneer Park.



THE CENTER OF SAN BERNARDINO'S CIVIC ACTIVITIES

Lighting a Trunk-Line Highway in a Village

By Lester Rogers
President, The Commerce Club, Tecumseh, Michigan

WITH unusual foresight on the part of village citizens, the Council and the Chamber of Commerce, Tecumseh's boulevard lighting system was installed soon after the State Highway Department had completed laying the paved trunk line through this village, adding much to the beauty of the main thoroughfare and keeping the cost of the project down by the immediate installation of two ornamental lighting posts in each block. Had this work been left until a few years later, there would have been an increased expense for the excavation of a trench forming the bed for the cable.

The entire village is lighted by the series system, the boulevard lights cutting into this circuit by means of transformers. The 2,400-volt circuit is reduced to 500 volts because of the ever present danger of high voltage under ground; 6.6 amperes are required to illuminate each of the 250-candle-power lamps encased in glass at the top of Cutter Arcadian lamp posts. Each of the two boulevards, east and west, is equipped with an individual transformer. The posts are 11 feet high and are set on concrete bases. They are placed in the center of the boulevard a few feet from each end, as shown in the illustration.

The steel-armored cable, which is underground, consists of a copper conductor insulated with rubber over which is a braid cover. Next, there is a layer of tape which is enclosed in a continuous lead sheath. A wrapping of steel tape so arranged as to insure ample over-lapping when the cable is bent, prevents injury to the lead sheath. An outer serving of jute affords protection to the steel when placed in the ground.

THOROUGHFARE LIGHTING IN TECUMSEH, MICH., SHOWING BOTH SINGLE AND FIVE-LIGHT CLUSTER STANDARDS

In the business section a multiple three-wire system is employed. Five globes containing four 50-watt lamps and one 100-watt lamp are attractively arranged on each post. There are twelve of these posts in each block. The current for these lamps is reduced to 110 volts.

The approximate cost of each of the sixteen boulevard lamps is $46. The cost of installation by the Tecumseh Electric Company was about $150. In the month of January, 1925, the cost of current for the boulevard lights was $110.11. During the month of July, 1924, the expense for this purpose was $39.27. These figures are given by Village Clerk K. D. Hall.

Motor Fire Equipment in Service in Smaller American Cities

A CHILDS PUMP AND HOSE CAR EQUIPMENT RECENTLY PURCHASED BY THE CITY OF ATHENS, N. Y.
This is the third piece of Childs equipment this city has purchased. In March, 1923, it purchased a triple-combination and a two-tank straight chemical equipment, both mounted on Graham chassis

NEW MOTOR FIRE APPARATUS OF THE GLOUSTER, OHIO, VOLUNTEER FIRE DEPARTMENT
The equipment of this triple-combination fire auto consists of a 300-gallon Hale pump, two 35-gallon Obenchain-Boyer chemical tanks, and a 1,000-foot hose bed, all mounted on a 1½-ton Graham truck chassis. Inasmuch as the town was heavily bonded and could not purchase the equipment which was needed, the Volunteer Fire Company took the responsibility of raising the funds by popular subscription. The drive was started in February, 1924, the equipment purchased and tested November 7, 1924, and paid for on December 15, 1924. We are indebted to E. R. Farris, Fire Chief, C. G. Lunsford, Assistant Chief, and E. J. Eddy, Secretary, Glouster Volunteer Fire Department, for the photograph and information

What Some Cities Have Done, All Can Do!

Drawing by Morris, prepared at the suggestion of THE AMERICAN CITY, *copyrighted by George Matthew Adams Service*

Will Your City Reduce Its Fatalities from Street Accidents This Year?

The figures given in the Honor Roll and in the following list are from statistics supplied by the Health Departments of the respective cities to the National Automobile Chamber of Commerce.

CITIES OF LESS THAN 100,000 AND MORE THAN 25,000 POPULATION SHOWING REDUCTIONS OF MORE THAN 25 PER CENT IN MOTOR FATALITIES IN 1924:

	1923	1924		1923	1924		1923	1924
Erie, Pa.	41	23	Cedar Rapids, Iowa	5	2	Petersburg, Va.	7	5
Binghamton, N. Y.	19	14	Montgomery, Ala.	11	5	Lynchburg, Va.	10	7
Terre Haute, Ind.	35	24	Pueblo, Colo.	7	4	Kokomo, Ind.	3	1
Sacramento, Calif.	32	23	Lexington, Ky.	9	6	Cumberland, Md.	18	10
Pawtucket, R. I.	26	15	Lima, Ohio	13	9	Zanesville, Ohio	11	5
Saginaw, Mich.	16	9	Charleston, W. Va.	7	4	Elgin, Ill.	7	4
Springfield, Ill.	7	4	Dubuque, Iowa	5	3	East Cleveland, Ohio	5	3
Chester, Pa.	11	7	Joliet, Ill.	21	10	Rome, N. Y.	2	1
Quincy, Mass.	12	8	Evanston, Ill.	15	10	Bangor, Me.	3	2
Newton, Mass.	10	6	East Chicago, Ill.	17	10	Port Huron, Mich.	3	2

Water-Supply Statistics for Municipalities of Less Than 5,000 Population—III

Statistics from 3,700 Cities Compiled for Publication in THE AMERICAN CITY and the 1925 Municipal Index—The Following Explanatory Material Is Reprinted from Our February Issue

THROUGH the cooperation of municipal water-works officials and the officers of water companies, THE AMERICAN CITY MAGAZINE is able to offer to its readers and to recipients of the 1925 Municipal Index the largest compilation of water-supply statistics that has yet been published. In order to facilitate the distribution of these statistics, all the data for cities of over 5,000 population are being published in the 1925 Municipal Index, and for cities of less than 5,000 population in THE AMERICAN CITY MAGAZINE serially, beginning with February, 1925.

The tables, in which the cities are arranged alphabetically by states, show whether the water-works are owned by the municipality or by a private company. The source of supply is recorded merely as underground or surface, the former including shallow wells, deep wells, artesian wells, flowing springs, and mountain springs, and the second such sources as rivers, lakes, ponds, canals, and creeks.

The distance of the source from the city is an important matter from the fire protection standpoint as well as from the standpoint of comparison when it comes to capital investment. Storage facilities are described under three heads, namely, reservoirs, stand-pipes, and elevated tanks.

Filtration systems are divided into mechanical or American systems, slow sand filtration or the older type of filtration, and pressure filters, as applied to the mechanical filtration. In examining the entire set of reports, only chlorine and hypochlorite show as American sterilization practice to-day, with liquid chlorine by far the most common method.

In order that some idea of the total investment in pumps may be reached, the total pump capacity in million gallons daily is recorded. In some instances where low-lift pumps are used to move water from a river to a filtration plant and then high-lift pumps are used to force the filtered water through the distribution system, the total pump capacities may give an erroneous idea as to the capacity of the system. Lack of space, however, made it impossible to differentiate in these cases, as the pump capacity is recorded chiefly to show the investment in this element of the plant.

American cities are noteworthy for their excessive consumption of water. Even communities where industrial uses are not great have consumptions of 500, and some even as high as 1,000 gallons per capita. As far as possible, in these statistics domestic services are differentiated from those supplying stores, factories and industries.

Statistics are given for the number of hydrants in each city and whether they are owned by the municipality, or by the water company. The average rental per hydrant per year is given in those cases where a hydrant is charged to the water company or is credited to the account of a water department. In many cases water companies charge no hydrant rental, as such service is required in their franchise. Unfortunately, in only a few cases are water departments credited with the maintenance of the hydrants.

The average pressures for water-supplies, as well as the increased pressures for fire service, are given, as this has some bearing on the general type of pipe in use.

The following symbols are used throughout these tables to make it possible to give a greater amount of information in small space:

A —American type, rapid or mechanical filter
B —Brass pipe
C —Concrete pipe
Ch —Sterilization by liquid chlorine
Cl —Cement-lined pipe
Co —Copper pipe
F —Pressure filter
G —Galvanized iron pipe
H —Consumer or householder
Hy —Sterilization by hypochlorite
I —Cast iron pipe
K —Kalamein pipe (also Calamein and Calamine)
L —Lead pipe
Ll —Lead-lined pipe
M —Municipally owned
O —Slow sand filter
P —Owned by private company
Pp —Stand-pipe
R —Storage or distribution reservoir
Ri —Rolled iron pipe
Tc —Terra cotta pipe
Rv —Riveted pipe
S —Surface source of water-supply
So —Water softener
St —Steel pipe
T —Elevated tank
Tl —Tin-lined pipe
U —Underground source of water-supply
V —Vitrified pipe
W —Wood pipe
Wr —Wrought iron pipe

Municipality Ownership of Water works	Population	Source		Storage	Filters	Sterilised	Distribution System			Pipe Sizes Inches		Pump Capacity m. g. d.	Main Supply Metered
		Type	Aver. Miles from City				Total Miles of Main	Kind of Pipe		Mains	Services		
								Mains	Services				
MAINE													
Alfred.....P	1,000	S	1.0	Pp	.....	.....	5.0	I	G	1-8	¾	0.9	No
Bethel.....P	1,792	S	4.5	R	.....	.....	8.0	I	G	4-10	.....	.....	No
Buckfield.....P	1,139	S	2.5	R	.....	.....	4.2	I	G	6-10	.....	None	No
Bucksport.....P	1,906	S	1.0	No	No	Ch	5.0	I	G	2-10	1-2	None	No
Cumberland.....P	1,150	U	3.0	T	No	.....	3.0	.....	G	1¼-3	⅝	.....	Yes
Dexter.....M	4,113	S	0.3	R	.....	.....	8.0	I	G	4-12	.....	0.8	...
Dover & Foxcroft.....M	3,500	S	1.3	R	.....	Ch	15.0	I	G	4-12	.....	3.4	No
Eastport.....P	4,494	S	7.5	RPp	No	Ch	17.0	I	G	4-10	¾	1.5	No
Farmington.....P	3,200	S	5.3	Pp	No	.....	16.0	I	G	4-10	¾-1	None	No
Fort Kent.....P	4,237	S	0.0	R	.....	.....	0.4	.....	.....	.....	.....	.....	...
Fryeburg.....P	1,283	S	3.0	R	No	.....	7.0	I	G	2-10	¾	None	No
Harrington.....P	1,024	S	1.5	R	.....	.....	5.0	I	.....	2-4	.....	.....	...
Kennebunk.....M	3,138	SU	2.5	Pp	A	Ch	50.0	I	.....	2-12	.....	2.0	Yes
Kingfield.....P	1,000	S	4.0	R	No	.....	6.0	I	G	6-8	¾	None	No
Kittery.....M	4,763	S	8.5	R	No	No	45.0	I	Wr G	6-10	¾-1	None	No
Lincoln.....P	2,452	S	6.0	R	No	.....	10.0	I St	G	12	¾	0.1	No
Lisbon.....M	4,100	U	0.3	Pp	No	.....	10.0	I	G	4-12	¾-8	0.8	No
Livermore Falls.....M	2,636	S	4.0	R	.....	Ch	15.0	I	G	6-12	1	0.7	No
Lubec.....M	3,371	U	2.5	RPp	No	Ch	9.0	I	I	4-10	.....	1.0	No
Mars Hill.....P	1,783	S	4.0	.....	No	No	7.0	I	G	1¼-8	¾	.....	No
Mechanic Falls.....P	1,800	S	0.5	Pp	O	Ch	6.8	I	G Wr	4-12	¾-2	2.4	No
Millbridge.....P	1,196	U	2.0	R	No	No	2.5	I	G	6	1½	0.06	No
Millinocket.....P	4,528	S	0.0	.....	A	No	.....	.....	G	1-16	6	None	No
Milo.....P	3,000	S	0.0	R	O	Ch	8.5	I	G	6-12	.....	1.0	No
Monson.....P	1,079	U	0.0	R	No	.....	1.3	G	G	1¼-2½	.....	.....	No
Norridgewock.....P	1,582	SU	0.5	Pp	.....	.....	1.3	I	G	½-3	.....	0.02	...
North Anson.....M	2,200	S	10.0	.....	No	.....	13.0	IW	G	2-8	¾-1	.....	No
Norway.....P	2,208	S	1.0	R	.....	Ch	4.5	I	G	4-10	¾-1	1.0	No
Oakland.....P	2,473	S	2.0	R	No	Ch	7.0	I	G	6-10	¾	2.5	No
Pittsfield.....M	2,800	U	1.0	Pp	.....	.....	11.0	I	G	.....	.....	1.0	No
Randolph.....M	1,145	S	....	.....	O	.....	2.0	I	Wr	2-8	.....	.....	No
Rangeley.....P	1,028	S	4.0	R	No	No	....	.....	.....	6-10	.....	.....	No
Richmond.....P	1,800	S	0.0	R	A	Ch	4.5	I	G	1¼-10	¾	1.3	No
South Paris.....M	2,000	U	3.0	R	.....	.....	3.0	.....	.....	.....	.....	.....	No
Southwest Harbor.....P	880	S	2.5	Pp	.....	.....	4.0	I	.....	6	.....	0.04	...
Springvale.....P	2,000	U	1.5	RPp	O	Ch	7.0	.....	IG	6-12	.....	0.6	No
Stockton Springs.....P	1,175	U	6.5	.....	No	No	25.0	I	.....	6-12	¾	None	No
Sullivan.....P	.....	S	3.0	No	No	No	3.3	I Wr	I Wr	2½-8	¾	None	...
Union.....P	1,133	U	1.0	R	No	No	2.0	I	G	6-8	1½-1	None	No
Van Buren.....M	4,594	S	3.0	R	No	Ch	11.0	W St	G	6-10	¾-3	.....	No
Vinalhaven.....P	1,965	S	3.0	Pp	.....	.....	7.0	I	G	6-10	.....	0.3	No
Waldoboro.....P	2,426	SU	0.8	R	No	.....	3.0	I	G	6-8	1½-3½	0.5	No
Warren.....P	1,500	U	2.0	R	No	.....	2.5	I	G	4-8	1½-3½	0.03	...
Winterport.....P	1,423	SU	0.5	RPp	.....	.....	4.0	I	G	4-10	.....	0.7	No
Yarmouth.....M	2,300	U	2.5	PpT	No	Ch	20.0	I St	G	1¼-10	¾	2.4	No
York.....P	2,727	S	4.0	No	No	No	25.0	I	G	6-16	.....	.....	...
MARYLAND													
Boonsboro.....P	1,085	U	2.5	RT	No	.....	6.0	IW	G	2-6	½-1½	0.04	No
Centerville.....M	3,841	U	0.8	Pp	.....	Ch	5.0	I	.....	.....	.....	1.3	...
Chestertown.....M	2,337	U	0.3	T	No	No	6.0	I	G	4-10	.....	0.5	Yes
Denton.....M	3,394	U	0.1	T	.....	.....	3.0	G	G	4-6	⅝	.....	No
Laurel.....M	2,800	S	1.3	RPp	A	Hy	12.0	I	G	4-8	¾-1	1.3	No
Ridgely.....M	1,000	U	0.0	T	No	No	....	I	G	4-6	.....	.....	No
Rockville.....M	1,181	U	0.5	RPp	.....	Ch	3.0	I	I	4-8	¾	0.3	No
Taneytown.....M	1,000	U	0.5	Pp	.....	.....	2.0	.....	G	4-8	1	.....	Yes
Thurmont.....P	1,200	U	1.5	R	No	No	5.3	I	G	2-6	¾	None	No
Union Bridge.....P	1,603	U	0.1	R	No	Ch	2.5	I	G	4-6	1	0.3	No
Westernport.....M	3,977	S	9.0	R	No	Ch	3.0	I	G	2-6	.....	None	No
MASSACHUSETTS													
Acton.....M	2,162	U	0.5	Pp	.....	.....	15.0	I	St C	6-12	1	0.9	No
Ashburnham.....M	2,012	S	1.0	R	No	No	9.0	I	GL	6-10	½-2	0.6	Yes
Ashfield.....P	869	S	1.5	R	No	No	2.9	I	G	4-8	¾	None	No
Ashland.....M	2,287	U	1.0	Pp	No	.....	8.2	I	Cl	6-12	1-1¼	0.7	No
Avon.....M	2,176	U	....	Pp	No	.....	8.5	I	Wr Cl	6-10	1	1.0	No
Ayer.....M	3,052	U	1.0	RPp	.....	.....	12.4	I	G	4-14	.....	1.5	...
Barre.....M	3,357	S	1.0	R	.....	.....	5.0	I	Cl	4-12	.....	.....	...
Bedford.....M	1,362	SU	2.0	RPp	O	.....	9.6	I	Cl Ll	6-12	1-6	0.7	No
Belchertown.....M	2,058	....	0.3	T	.....	.....	3.5	I	Wr G	6-8	1	.....	Yes
Blandford.....M	479	S	0.8	R	No	No	2.0	I	G	1-6	¾-1	0.1	No
Brookfield.....M	2,216	SU	1.5	R	.....	.....	3.8	I	GL	6-12	.....	0.2	...
Charlton City.....PM	1,995	S	1.0	R	No	No	1.5	I	G	6-12	.....	0.5	No
Cheshire.....P	1,476	U	2.0	R	.....	No	7.0	I	G	3-8	.....	None	No
Colrain.....M	1,607	S	0.3	No	No	No	1.0	I	G	4-6	¾	None	No
Cummington.....M	489	U	0.5	R	No	.....	1.0	I	G	4-8	¾-1	0.5	No

Consumption		Number of Services		Number of Meters		Per Cent Metered		Meter Rates per 1,000 Gallons		Meters Owned by	Hydrants			Average Pressure lbs. per sq. in.	
Average Daily in 1,000 gals.	Per Capita	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Max. Dom.	Min. Ind.		Number	Owned by	Aver. Rental each per year	Domestic	Fire
7	7	125	None	32	.....	36	.....	50¢	.....	H	22	P	$54.50	93	93
.....	.....	231	2	9	1	4	50	17¢	8¢	P	31	P	$30	85	85
.....	.....	110	6	.....	1	.....	2	.....	40¢	H	21	P	.....	85	85
Unknown	.....	200	8	None	None	.....	.....	.....	.....	.....	10	P	None	40	40
.....	.....	55	None	.....	.....	.....	.....	.....	.....	.....	None	.....	.....	.....	.....
200	49	1,000	.....	850	.....	85	.....	40¢	40¢	M	87	M	.....	108	108
500	143	740	7	None	None	.....	.....	.....	.....	.....	97	M	$40	75	75
450	100	819	31	819	31	100	100	45¢	30¢	P	68	P	$66.66	80	65
250	78	810	12	.....	5	.....	42	10¢	7¢	M	65	P	$40	85	85
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42	.....	.....	87	.....
.....	.....	240	4	None	None	.....	.....	.....	.....	.....	19	P	$13	60	60
.....	.....	120	.....	None	.....	.....	.....	.....	.....	.....	6	P	None	12	15
1,000	320	3,000	11	1,340	11	45	100	.....	.....	.....	258	M	$35	63	80
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	P	$32	85	85
200	42	1,250	1	None	3	.....	100	.....	20¢	M	80	M	$30.30	75	60
.....	.....	300	50	.....	4	.....	8	.....	.....	P	20	P	$125	55	75
120	29	838	.....	419	.....	50	.....	33¢	.....	M	84	M	$90	60	60
.....	.....	720	5	None	.....	.....	.....	.....	.....	.....	38	M	$40	50	75
50	15	400	25	200	25	50	100	10¢	5¢	M	30	M	None	75	75
.....	.....	215	.....	None	.....	.....	.....	.....	.....	P	23	P	$43.50	120	110
80	44	420	6	150	6	36	100	50¢	12¢	H	42	P	$40	93	93
30	25	120	.....	80	2	67	.....	30¢	30¢	P	None	.....	.....	45	45
250	55	796	23	None	None	.....	.....	.....	.....	.....	58	P	$40	45	100
400	133	664	4	200	1	30	25	30¢	6¢	.....	60	P	$40	125	.....
.....	.....	77	None	1	None	1	.....	.....	.....	.....	None	.....	.....	40	.....
5	3	70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	375	4	3	3	1	75	30¢	10¢	P	46	M	$50	95	95
250	113	400	4	16	.....	.....	.....	30¢	20¢	H	42	P	$45	85	90
300	124	426	14	4	8	1	57	25¢	6¢	P	36	P	$40	102	.....
300	107	385	.....	300	.....	85	.....	33¢	9¢	M	84	M	$23.65	75	100
.....	.....	187	.....	.....	.....	.....	.....	.....	.....	.....	13	M	.....	90	90
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	P	.....	70	105
150	84	300	4	6	1	2	25	33¢	33¢	P	45	P	$50	70	80
150	75	300	.....	10	.....	3	.....	20¢	9¢	.....	38	.....	.....	93	93
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	P	8	P	$50	100	160
175	58	600	.....	200	.....	33	.....	25¢	20¢	P	50	P	.....	75	75
.....	.....	170	3	.....	1	.....	33	30¢	8¢	P	31	P	$37.50	80	80
.....	.....	40	None	None	None	.....	.....	.....	.....	.....	None	.....	.....	60	60
.....	.....	86	1	None	None	.....	.....	.....	.....	.....	3	P	.....	70	70
500	100	600	5	None	None	.....	.....	.....	.....	.....	57	M	$45	40	80
80	41	290	.....	5	.....	2	.....	.....	.....	P	21	P	.....	68	70
35	14	170	1	.....	.....	.....	.....	.....	.....	.....	12	P	$50	70	70
26	17	200	2	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	60	60
.....	.....	225	.....	2	.....	9	.....	.....	.....	.....	20	.....	.....	57	90
140	61	693	10	283	.....	41	.....	45¢	22¢	M	60	M	.....	75	100
.....	.....	100	.....	None	.....	.....	.....	.....	.....	.....	98	P	$45	60	60
40	37	184	2	2	2	1	100	.....	40¢	P	25	P	$26	105	110
150	39	300	.....	10	.....	3	.....	40¢	20¢	M	28	M	.....	40	40
200	86	650	.....	200	.....	31	.....	30¢	15¢	M	59	M	$19	70	70
65	19	.....	.....	40	.....	.....	.....	25¢	25¢	M	25	M	.....	45	45
140	50	390	10	None	2	.....	20	.....	10¢	M	.....	M	$7.80	60	60
63	63	100	6	None	None	.....	.....	.....	.....	.....	.....	M	None	.....	45
40	34	300	.....	300	.....	100	.....	.....	.....	M	33	M	.....	60	90
.....	.....	.....	.....	.....	.....	90	100	40¢	25¢	M	21	M	.....	60	100
150	125	222	.....	4	.....	2	.....	.....	.....	P	27	P	$7.50	50	80
125	74	140	.....	3	9	2	.....	50¢	50¢	P	19	.....	.....	60	100
375	95	900	3	None	.....	.....	.....	.....	.....	.....	34	M	.....	145	145
.....	.....	520	.....	500	.....	.....	.....	48¢	.....	M	110	M	$25	97	97
100	50	350	4	350	4	100	100	27¢	25¢	M	64	M	$23	115	115
.....	.....	74	None	None	None	.....	.....	.....	.....	.....	16	P	$15.60	.....	105
225	99	340	5	445	5	100	100	25¢	20¢	M	75	M	None	75	.....
91	42	527	.....	268	.....	51	.....	40¢	30¢	M	69	M	None	65	65
173	57	737	2	560	2	76	100	50¢	15¢	MH	98	M	$17.90	97	97
100	30	350	.....	18	.....	5	.....	50¢	40¢	M	44	M	$40	65	93
40	29	300	3	225	3	75	100	40¢	20¢	M	70	M	$10	70	80
7	3	65	.....	65	.....	100	.....	83¢	.....	M	40	M	.....	25	.....
5	10	96	.....	96	.....	100	.....	60¢	.....	M	11	M	$5	87	.....
200	90	300	.....	85	.....	42	.....	30¢	30¢	H	49	M	.....	78	78
.....	.....	25	3	None	None	.....	.....	.....	.....	.....	16	P	.....	57	140
.....	.....	224	None	None	None	.....	.....	.....	.....	.....	25	P	None	85	85
.....	.....	26	.....	26	.....	100	.....	27¢	.. ..	M	12	M	None	90	90
5	10	35	1	6	26	17	....	20¢	....	M	11	M	None	90	90

Municipality Ownership of Water works	Population	Source Type	Source Aver. Miles from City	Storage	Filters	Sterilized	Distribution System Total Miles of Main	Distribution System Kind of Pipe Mains	Distribution System Kind of Pipe Services	Pipe Sizes Inches Mains	Pipe Sizes Inches Services	Pump Capacity m. g. d.	Main Supply Metered
MASS. (con.)													
Dalton.....M	3,752	S	2.0	R	.....	.....	5.0	IG	R	4–14	.....	.....	No
Dana.....P	800	U	1.0	R	No	No	2.5	GL	GL	1½–2	¾–¾	0.01	No
Duxbury.....M	1,553	U	2.5	R	No	No	17.0	I	G Cl	6–12	¾–2½	1.2	No
E. Brookfield.....M	550	U	0.8	Pp	O	No	2.3	I	G	6–10	1	0.2	No
E. Long Meadow.....M	2,352	S	....	.....	O	.....	9.5	I	I	4–8	.....	.....	Yes
Egremont.....P	441	S	3.0	.....	No	No	4.2	I	G	2–6	¾	None	No
Falmouth.....M	4,000	S	2.0	Pp	No	.....	72.0	I	G	2–12	¾–2	3.3	No
Foxboro.....M	4,136	U	1.5	Pp	No	.....	20.0	I	.....	4–12	.....	1.0	...
Gill.....P	879	U	1.0	R	No	.....	4.8	I Wr	.....	1¼–6	¾	.....	...
Groveland.....M	2,650	S	1.0	.....	No	.....	11.5	I	G	2–10	¾–1¼	.....	Yes
Hadley.....M	2,784	U	2.5	.....	No	.....	17.0	I	G Wr	4–12	¾–2	None	No
Hanson.....M	1,910	S	6.0	.....	.....	.....	1.5	I	G	6–8	1	.....	No
Hatfield.....M	2,651	S	4.0	.....	.....	.....	22.0	I	G	2–8	¾	None	No
Hinsdale.....M	1,065	S	1.3	R	No	No	5.5	I	G	4–10	¾	None	No
Holbrook.....M	3,161	S	5.0	Pp	No	.....	14.3	I	Cl B	4–12	.....	4.0	No
Holliston.....P	2,707	U	0.8	RPpT	No	Ch	8.7	I	G	2–12	.....	.....	No
Housatonic.....P	2,010	S	4.5	T	No	No	16.0	I	G Wr	4–14	¾	None	No
Hyannis.....P	1,550	U	1.0	Pp	No	.....	13.0	I	Cl	1–6	1	1.0	...
Lancaster.....M	2,461	SU	....	.....	No	No	20.0	I	.....	4–8	1–2	.....	...
Lenox.....P	2,091	U	4.0	R	No	No	30.0	I	G	2–10	.....	0.9	Yes
Littleton.....M	1,277	U	2.0	Pp	No	No	9.7	I	G	6–12	.....	0.3	No
Longmeadow.....M	3,200	S	..	...	.....	.....	16.3	I	G Wr	4–10	1	.....	Yes
Manchester.....M	2,466	SU	1.5	Pp	.....	.....	25.3	I	Wr Cl	6–16	.....	4.1	Yes
Marion.....M	1,283	U	2.0	Pp	.....	.....	18.5	.....	G	4–12	.....	0.6	No
Mattapoisett.....M	1,500	U	2.0	Pp	.....	.....	15.5	I	G Wr	2–10	¾–1½	0.4	No
Medfield.....M	3,500	U	0.5	T	.....	.....	6.0	I W St	G	1–6	1	0.6	...
Medway.....M	2,956	U	0.3	Pp	.....	.....	12.4	I	Cl G	4–12	1–3	1.0	No
Merrimac.....M	2,173	U	0.8	Pp	.....	.....	9.5	I	Cl	6–12	.....	2.3	No
Miller's Falls.....M	2,050	S	2.0	R	No	No	8.5	I	G	4–10	¾–2	None	Yes
Monson.....M	4,826	SU	3.0	R	.....	.....	16.0	I	G	4–12	1	.....	No
Nantucket.....P	2,797	SU	2.0	Pp	No	No	12.0	I	G W	1½–10	½–6	2.8	No
N. Chelmsford.....M	2,465	U	0.8	Pp	No	No	7.0	I	Cl	4–12	.....	0.6	No
Northfield.....P	1,775	S	1.0	R	No	.....	1.7	I W	G	4–6	¾	.....	No
Norton.....P	2,374	U	2.0	Pp	No	No	12.3	I	G Cl	4–16	1	1.1	...
Oxford.....P	4,000	U	2.0	Pp	No	.....	11.9	I	G	2–10	¾	1.0	No
Pembroke.....PM	1,358	SU	0.0	RPpT	No	No	2.0	I St	BWr ClG	2–24	1	.....	No
Pepperell.....M	2,468	U	3.5	Pp	.....	.....	23.0	I	G	4–12	1	0.7	No
Provincetown.....M	4,300	U	4.0	Pp	No	.....	12.0	I	Wr	3–12	.....	1.0	No
Rockport.....M	3,978	S	1.5	Pp	.....	.....	13.2	I	G	4–10	.....	2.0	No
Russell.....M	1,237	S	1.5	R	No	No	9.0	I	G	4–8	4	None	No
Rutland.....M	1,743	S	1.5	Pp	No	No	7.5	I	G	4–12	¾–1	1.0	No
Sharon.....M	3,400	U	1.3	Pp	No	No	23.0	IC	L	2–12	¾–6	0.6	No
Shelburne Falls.....M	2,573	S	3.5	RPpT	No	No	11.0	I	G	2–10	.....	None	...
Southfield.....P	150	S	1.0	Pp	No	No	1.5	.....	.....	2	¾	None	No
Sunderland.....P	1,289	SU	2.5	.....	.....	.....	4.9	I	G	1–6	¾	.....	No
Vineyard Haven.....M	806	U	1.5	RPp	No	.....	9.5	I	LG	4–14	.....	2.0	...
Warren.....M	.....	U	0.5	Pp	No	.....	8.0	I	Cl	6–12	1	0.6	No
Weston.....M	2,282	U	1.5	R	No	No	15.0	I	G	4–8	¾–2	0.9	No
Williamsburg.....M	1,866	S	2.8	R	.....	.....	.....	I	I	4–8	.....	.....	...
Williamstown.....P	3,707	SU	3.0	RPp	No	No	10.0	I	I	2–10	.....	None	No
Worthington.....M	409	SU	2.0	RPp	No	No	5.0	I St	G	2–6	½–1	None	No
MICHIGAN													
Ahmeek.....P	1,000	S	12.0	R	.....	.....	12.0	I	....	4–6	¾	.....	Yes
Algonac.....M	1,303	S	....	Pp	No	Ch	13.5	I St	G	2–8	¾–1	2.2	No
Almont.....M	1,737	U	0.0	R	.....	.....	3.5	I	G	4–6	.....	0.05	No
Armada.....M	800	U	0.5	RPp	.....	.....	3.0	I	G Wr	4–8	¾	0.4	Yes
Athens.....M	700	U	0.0	Pp	No	No	5.0	I	G	2–6	.....	0.5	No
Belding.....M	4,500	SU	1.0	RPp	.....	.....	15.0	.....	Wr G	4–12	¾–1¼	2.0	No
Bellaire.....M	1,050	SU	....	R	No	No	5.0	St	G	2–6	½–1	0.7	No
Big Rapids.....M	4,558	S	0.5	R	No	Ch	30.0	I	.....	4–16	.....	4.0	No
Boyne City.....M	4,284	U	1.0	R	No	.....	15.0	I St	G	2–12	¾	2.3	No
Bronson.....M	2,129	U	0.5	Pp	No	No	6.0	I	I	4–12	¾–1½	1.1	No
Carson City.....M	923	S	0.5	Pp	No	.....	2.0	W	G	4–8	.....	.....	No
Cass City.....M	1,228	U	0.3	T	No	No	3.5	I	GL	4–8	¾	0.8	No
Cassopolis.....M	1,500	S	0.5	T	No	Ch	6.0	I	G	4–10	¾–2	0.5	Yes
Cedar Springs.....M	1,000	U	0.1	Pp	.....	.....	1.5	I	G	4	.....	0.9	Yes
Central Lake.....P	1,196	U	0.5	R	No	No	1.0	I St.	.....	3	.....	None	...
Charlevoix.....M	2,218	U	0.3	Pp	O	Ch	10.5	I	G	4–10	¾–2	1.5	Yes
Chelsea.....P	2,079	U	0.2	R	.....	.....	7.0	.....	I	4–8	.....	1.6	...
Chesaning.....M	2,499	U	....	RT	No	No	6.0	I	L	4–10	.....	.....	No
Clinton.....P	1,000	S	0.2	No	No	No	0.5	I	G	6	.....	1.4	No
Corunna.....M	2,000	U	0.5	PpT	No	No	5.4	I	G	4–8	¾	0.7	No
Crystal Falls.....M	3,394	S	0.8	Pp	...	Ch	5.0	I	G	4–6	.....	0.07	No
Dearborn.....P	4,500	S	1.0	RT	A	Hy	14.9	I	G	6–16	¾–2	.....	Yes
Decatur.....M	1,285	U	0.0	Pp	.....	.....	6.0	I	G	4–8	¾	1.2	No
Durand.....M	2,090	U	0.5	RT	No	No	8.5	I	I	3–10	.....	0.5	No

Consumption		Number of Services		Number of Meters		Per Cent Metered		Meter Rates per 1,000 Gallons		Meters Owned by	Hydrants			Average Pressure lbs. per sq. in.	
Average Daily in 1,000 gals.	Per Capita	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Max. Dom.	Min. Ind.		Number	Owned by	Aver. Rental each per year	Domestic	Fire
800	214	900	.....	None	.....	.....	.....	.....	.....	.....	130	M	None	100	100
.....	.....	17	None	None	.....	.....	.....	.....	.....	.....	None	.....	.....	.....	.....
120	77	500	.....	585	.....	90	.....	60¢	25¢	M	154	M	None	75	25
45	82	138	5	67	5	63	100	40¢	20¢	H	25	M	None	67	67
300	128	375	....	300	.....	80	.....	30¢	.....	M	77	M	.....	67	67
.....	.....	54	None	7	None	13	.....	22¢	.....	P	7	P	.....	80	.....
475	119	1,812	25	.....	25	.....	100	.....	24¢	M	200	M	$30	80	80
400	97	705	.....	600	.....	90	.....	40¢	10¢	M	137	M	$25	60	70
.....	.....	47	None	None	.....	.....	.....	.....	.....	.....	None	.....	.....	25	.....
62	23	504	None	245	None	49	.....	48¢	.....	M	74	M	.....	102	112
.....	.....	294	2	None	2	.....	100	.....	10¢	M	70	.....	.....	70	70
.....	.....	200	3	200	3	100	100	30¢	20¢	M	21	M	$15	130	130
120	45	361	.....	None	.....	.....	.....	.....	.....	.....	115	M	.....	42	42
.....	.....	120	1	None	None	.....	.....	.....	.....	.....	50	M	.....	83	83
265	84	955	.....	74	22	8	.....	22¢	15¢	M	100	M	$30	70	70
.....	.....	301	.....	1	1	.....	.....	.....	.....	H	30	P	$60	95	95
.....	.....	550	.....	7	9	1	.....	30¢	7¢	P	12	P	$25	65	65
100	65	500	.....	15	.....	3	.....	33¢	33¢	P	72	.....	.....	80	80
116	47	475	.....	450	.....	95	.....	.....	.....	.....	62	.....	.....	110	110
250	93	354	.....	386	.....	96	.....	45¢	45¢	P	51	M	$10	80	80
35	27	263	.....	263	.....	100	.....	50¢	10¢	M	55	M	$24	90	90
170	53	837	.....	831	.....	99	.....	30¢	.....	H	183	M	None	110	110
347	141	1,007	15	1,196	15	100	100	27¢	.....	M	212	M	$15	106	106
110	85	552	.....	188	.....	34	.....	25¢	.....	M	130	M	$25	60	83
76	51	550	.....	None	.....	.....	.....	.....	.....	.....	75	M	.....	71	85
70	20	280	2	.....	.....	.....	.....	.....	.....	.....	1	M	.....	38	.....
150	50	600	.....	240	.....	40	.....	40¢	20¢	M	113	M	$15	70	70
150	60	589	.....	34	.....	6	.....	33¢	20¢	M	67	M	.....	100	100
.....	.....	320	5	320	5	100	100	58¢	25¢	M	60	M	.....	97	97
350	75	525	5	250	7	50	100	30¢	8¢	M	101	M	.....	135	135
400	143	1,436	8	None	4	.....	50	.....	25¢	P	100	P	$55	50	75
75	30	490	.....	366	.....	75	.....	32¢	32¢	H	59	M	.....	85	120
.....	.....	95	.....	65	.....	69	.....	40¢	.....	P	10	H	None	50	50
200	85	394	6	13	16	3	100	45¢	45¢	M	61	M	$125	90	120
75	19	500	.....	369	. ...	74	.....	30¢	10¢	P	66	MH	$75	93	93
Unknown	.....	61	3	40	.....	66	.....	.....	.....	H	4	P	$10	75	100
133	54	613	.....	497	.....	81	.....	45¢	30¢	M	154	M	$6.49	70	70
400	93	1,360	.....	700	.....	52	.....	20¢	.....	H	80	M	None	70	87
368	93	1,496	.....	26	.....	2	.....	.....	.....	.....	161	M	.....	60	60
60	49	260	6	5	8	2	100	7¢	7¢	M	40	M	None	150	175
.....	.....	145	.....	95	.....	65	.....	25¢	12¢	H	27	M	.....	65	65
235	69	724	.....	16	.....	2	.....	35¢	20¢	MH	145	.....	.....	64	64
.....	.....	404	.....	404	.....	100	.....	25¢	8¢	M	68	M	None	124	124
.....	.....	40	.....	None	.....	.....	.....	.....	.....	.....	None	.....	.....	50	80
.....	.....	112	.....	0	.....	.....	.....	.....	.....	.....	9	H	None	35	35
.....	.....	450	.....	4	.....	9	.....	.....	.....	M	45	M	$22.22	40	60
50	.....	300	.....	8	.....	3	.....	.....	.....	M	66	M	.....	80	80
150	66	405	.....	355	....	88	.....	30¢	.....	M	85	M	$25	65	65
.....	.....	230	.....	2	.....	1	.....	.....	.....	.....	57	M	.....	97	97
.....	.....	800	20	500	20	63	100	50¢	.....	P	86	P	$35	100	165
.....	.....	52	None	None	.....	.....	.....	.....	.....	.....	24	M	.....	75	.....
10	10	80	2	80	2	100	100	75¢	23¢	H	8	M	.....	40	140
300	230	600	.....	12	.....	2	.....	.....	.....	M	45	M	.....	33	100
.....	.....	.....	.....	.....	.....	.....	.....	15¢	15¢	H	36	M	.....	60	60
24	30	250	.....	250	.....	100	.....	20¢	.....	H	27	M	.....	40	80
10	14	.....	.....	100	.....	.....	.....	20¢	.....	.....	30	.....	.....	60	80
210	47	961	.....	925	.....	96	.....	20¢	.....	M	59	M	$50	79	100
50	48	100	2	0	0	0	0	.....	.....	.....	23	M	None	80	125
1,500	330	1,100	.....	0	.....	0	.....	.....	8¢	M	130	M	None	70	110
500	117	900	.....	210	.....	23	.....	15¢	7¢	M	118	M	$25	40	125
70	33	289	104	289	104	100	100	35¢	15¢	H	41	M	$30	60	100
160	173	150	6	0	6	0	100	10¢	10¢	M	30	M	.....	.....	90
60	49	340	0	335	0	98	.....	50¢	10¢	M	34	M	None	56	78
100	67	475	.....	450	.....	95	.....	.....	.....	H	40	M	.....	40	90
.....	.....	550	38	.....	.....	.....	.....	.....	.....	.....	16	M	.....	60	90
.....	.....	.....	.....	.....	.....	.....	.....	15¢	15¢	P	7	M	.....	38	.....
500	226	800	.....	800	.....	100	100	20¢	20¢	H	105	M	.....	80	110
250	120	600	.....	600	.....	100	.....	20¢	10¢	H	39	.....	.....	73	70
75	30	225	.. .	200	...	89	.....	.....	.....	.....	25	M	.....	55	100
.....	.....	50	3	.....	2	.....	67	20¢	10¢	H	6	.....	.....	40	100
7	4	325	8	325	8	100	100	75¢	75¢	M	55	M	None	45	120
600	177	560	51	.....	4	.....	8	.....	.....	M	63	M	.....	45	120
1,000	222	600	5	600	5	100	100	15¢	9¢	H	136	M	None	60	60
100	78	430	.....	430	.....	100	.....	15¢	10¢	M	43	M	None	50	150
300	111	650	.....	625	.....	96	.....	24¢	15¢	M	56	M	None	50	50

Municipality Ownership of Water works	Population	Source Type	Source Aver. Miles from City	Storage	Filters	Sterilized	Distribution System Total Miles of Main	Distribution System Kind of Pipe Mains	Distribution System Kind of Pipe Services	Pipe Sizes Inches Mains	Pipe Sizes Inches Services	Pump Capacity m. g. d.	Main Supply Metered
MICHIGAN (con.)													
E. Grand Rapids....M	2,800	S	0.5	T	No	Ch	....	St	GL	2-4	¾-2	2.6	No
Elk Rapids....M	1,673	S	0.5	No	O	No	7.5	I	G	4-8	¾-2	1.9	No
Fennville....M	1,000	U	....	T	.....	.....	2.0	I	.....	4-8	.....	0.3	No
Fenton....M	2,507	U	0.0	R	No	No	8.0	.....	G	2-8	¾	0.06	Yes
Flushing....M	1,300	U	1.0	Pp	.....	.....	5.0	I	GL	4-10	¾	0.1	No
Fowlerville....M	1,000	U	....	RPp	.....	.....	4.5	.....	G	2-8	¾-1	1.0	No
Fremont....M	2,250	U	0.3	RPp	No	No	4.0	I	G	4-10	.....	2.3	No
Gaylord....M	1,538	U	0.0	RPp	No	.....	4.0	IW	G	4-6	¾	1.1	Yes
Gladstone....M	4,953	S	0.5	.....	.....	Ch	9.0	I	G	4-12	¾-2	2.5	Yes
Gladwin....M	1,225	U	....	RPp	No	No	3.0	IW	G	4-10	¾	0.1	No
Harbor Beach....M	1,927	S	0.0	Pp	.....	.....	6.4	I	.....	4-6	.....	2.1	...
Harbor Springs....M	1,805	U	0.5	RPp	No	No	22.0	I St	St Wr	2-8	.....	2.7	No
Holly....M	.....	U	....	RT	No	No	5.0	IW	G	.....	.....	1.2	Yes
Howard City....M	1,046	S	0.0	Pp	No	.....	4.0	I	G	4-8	.....	1.5	No
Hudson....M	2,500	U	....	No	No	.....	12.0	I	G	4-12	.....	2.0	No
Jonesville....M	1,396	U	0.2	Pp	.....	.....	5.5	I	G	4-10	¾	1.5	No
Lake Odessa....M	1,247	U	0.5	No	No	No	4.5	I	G	4-8	¾	1.8	No
Lakeview....M	1,000	S	0.0	T	No	No	0.2	I	G	4-8	¾-1½	1.0	No
Leslie....M	1,963	U	....	....	No	.....	4.0	.....	I	4-8	.....	0.8	No
Lowell....M	2,826	U	1.0	R	No	.....	15.0	I	LI	6-8	.....	1.4	Yes
Mancelona....M	2,451	U	1.3	T	No	No	3.5	I	G	2-8	.....	2.3	...
Manchester....M	1,050	U	0.8	Pp	No	No	5.0	I	Wr G	4-8	.....	.....	No
Manton....M	1,069	SU	0.3	....	.....	.....	5.0	I	I	4-8	.....	1.5	...
Marcellus....M	1,650	U	0.5	No	No	No	5.0	I	Wr	4-8	¾	0.9	No
Marlette....M	1,290	U	....	R	No	.....	5.5	I	GL	4-10	¾	1.6	No
Marshall....M	4,270	U	0.5	Pp	No	.....	15.5	I	G	2-12	.....	4.5	Yes
Mason....M	2,000	U	0.5	Pp	.....	.....	7.5	I	L	4-10	.....	1.1	No
Milan....M	1,355	U	0.2	PpT	.....	.....	6.0	St	G	4-10	¾	1.0	No
Milford....M	1,739	U	....	Pp	No	No	6.0	I	G	4-12	¾	1.5	No
Mount Pleasant....M	4,819	U	0.5	R	.....	.....	16.0	I	IL	4-12	.....	3.0	No
Nashville....M	1,346	S	0.5	Pp	No	No	4.5	I	GL	4-8	¾	1.0	No
Newaygo....M	1,300	U	0.3	T	No	No	1.2	I	G	4-6	¾	0.4	No
Newberry....M	2,300	U	0.3	No	.....	No	4.0	I	G	4-8	.....	1.6	Yes
North Branch....M	1,550	U	0.0	T	No	No	2.8	I	GL	4-6	¾-1	0.3	No
Onaway....M	2,789	U	0.3	RPp	No	.....	5.6	I	G	4-10	¾-1	0.9	No
Otsego....M	3,168	U	0.0	RT	No	Ch	8.0	I	IL	4-14	¾	3.2	No
Oxford....M	2,000	U	0.5	T	No	.....	5.5	I	GL	4-10	¾	1.9	Yes
Paw Paw....M	1,700	U	0.5	RPp	No	.....	6.0	.....	G	4-10	¾	1.4	Yes
Pentwater....M	1,018	U	0.2	R	No	No	3.8	I	I	4-8	.....	0.7	Yes
Quincy....M	2,213	U	0.0	No	No	.....	5.0	I	I	4-10	.....	2.3	No
Reading....M	1,991	U	0.3	.....	.....	.....	4.5	.....	G	4-8	.. ....	3.0	No
Redford....M	3,500	S	2.5	.....	A	.....	25.0	I	L	4-10	.....	1.2	Yes
Republic....M	2,345	S	1.0	RPp	.....	.....	3.0	W	W	4-8	¾	1.0	No
Richmond....M	1,577	U	....	Pp	.....	.....	5.0	I	G	4-8	.....	0.8	...
Rochester....M	2,549	U	2.3	R	No	No	15.0	I	G	4-12	¾-2	None	No
Rockford....M	1,600	S	35.0	Pp	No	.....	5.5	I	GL	2-8	¾	0.9	No
Romeo....M	2,102	U	1.3	Pp	No	No	8.3	I	GL	4-12	¾-1½	4.7	No
St. Charles....M	2,706	S	0.5	No	No	No	4.5	IW	G	8	3	0.9	No
St. Johns....M	3,925	U	0.3	RT	.....	.....	10.0	I	GL	2½-10	.....	.....	Yes
St. Louis....M	3,036	U	0.0	R	.....	.....	6.5	I	LG	4-10	¾	2.6	No
Shelby....M	2,625	U	0.2	R	No	No	3.0	I	G	10	¾	0.6	No
Shepherd....M	800	U	0.0	T	.....	.....	4.5	I	G	4-8	¾	0.03	No
Sheridan....M	1,279	S	0.5	T	.....	.....	1.5	St	G	¾-6	.....	0.3	No
South Haven....M	3,829	S	1.0	Pp	.....	.....	13.0	I	G	4-10	.....	2.0	...
Sparta....M	1,502	U	0.3	Pp	No	Ch	4.0	I	G	4-8	.....	1.7	No
Spring Lake....M	1,000	U	0.0	T	No	No	8.0	I	G	4-10	.....	0.08	No
Stambaugh....M	2,263	U	1.0	T	No	No	5.5	I	G	4-8	¾-¾	0.4	No
Stanton....M	886	U	0.5	R	No	No	3.0	IW	Wr	4-8	¾-2	1.2	No
Sturbridge....P	1,573	U	1.0	T	No	No	1.0	W St	GL	.....	½	None	No
Tecumseh....M	2,500	U	0.5	Pp	No	No	14.0	I St	GL	4-12	.....	2.0	....
Thompsonville....M	1,000	S	0.8	.....	No	No	3.3	I	G	2-8	¾	0.5	...
Trenton....M	1,682	S	0.3	RPpT	A	Ch	5.5	I	GL	1½-10	¾-1	4.9	Yes
Union City....M	1,340	U	0.1	T	.....	.....	10.0	I	G	3-12	¾-4	2.0	No
Vicksburg....M	1,624	U	0.3	T	.....	.....	6.0	I	G	4-8	.....	2.5	Yes
Watervliet....M	1,716	U	0.1	T	.....	.....	5.0	I	G	4-8	.....	0.01	No
Wayne....M	3,000	S	0.0	RPp	A	Ch	12.0	I	G	4-10	¾-4	2.6	Yes
White Pigeon....M	1,510	U	....	R	No	.....	0.8	I	.....	6-8	.....	0.2	No
MINNESOTA													
Adrian....M	1,087	U	....	Pp	No	.....	2.3	I	G	4-8	.. . ..	0.8	No
Albany....M	1,822	U	0.0	....	.....	.....	....	I	.....	4-8	.....	.....	No
Anoka....M	4,287	U	0.5	Pp	No	No	10.0	I St	.....	4-12	.....	2.9	No
Appleton....M	1,579	SU	0.0	PpT	.....	.. ..	5.0	I	G	4-8	.....	0.7	Yes
Aurora....P	2,809	U	0.3	RPp	.....	.....	3.0	I	G	4-6	.....	0.9	...
Barnesville....M	1,564	U	....	T	No	No	2.5	I	GL	4-6	¾	.....	No
Benson....M	2,111	U	0.0	RT	.....	.....	5.5	I	G	4-8	.....	0.7	Yes

Consumption		Number of Services		Number of Meters		Per Cent Metered		Meter Rates per 1,000 Gallons		Meters Owned by	Hydrants			Average Pressure lbs. per sq. in.	
Average Daily in 1,000 gals.	Per Capita	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Max. Dom.	Min. Ind.		Number	Owned by	Aver. Rental each per year	Domestic	Fire
300	107	600	2	600	2	100	100	12¢	12¢	H	73	M	None	50	80
300	180	280	0	21	0	7	0	15¢	.....	M	52	M	$40	40	100
80	80	150	.....	150	.....	100	.....	20¢	20¢	M	22	M	.....	60	70
300	119	500	.....	300	.....	60	.....	.....	.....	M	60	M	None	60	120
.....	.....	225	.....	225	.....	100	.....	.....	.....	M	32	M	None	70	70
.....	.....	200	38	200	38	100	100	25¢	25¢	M	40	M	.....	40	125
144	64	375	4	300	4	80	100	15¢	10¢	H	60	M	.....	75	75
40	26	200	10	150	8	75	80	40¢	20¢	P	23	M	$4.71	35	120
400	81	1,300	5	0	3	.....	.....	.....	5.5¢	M	64	M	$20	40	125
35	29	30	2	150	2	.....	.....	15¢	10¢	M	22	M	None	30	80
1,000	520	600	1	3	.....	.....	.....	.....	.....	.....	59	M	.....	75	100
250	139	775	.....	275	.....	36	.....	30¢	18¢	M	90	M	$25	76	125
.....	.....	460	8	460	8	100	100	.....	.....	M	37	M	.....	60	.....
150	143	294	.....	0	.....	.....	.....	.....	.....	.....	31	M	.....	40	90
500	200	700	.....	0	.....	.....	.....	.....	.....	.....	66	M	$30.40	50	100
300	215	400	.....	0	.....	0	100	10.5¢	.....	M	43	M	$30	63	78
218	175	500	6	450	6	90	100	40¢	6¢	M	52	M	.....	75	75
40	40	200	.....	0	.....	0	.....	.....	.....	.....	26	M	.....	43	80
.....	.....	300	.. .	.....	.....	.....	.....	.....	.....	.....	24	M	.....	.....	90
.....	.....	400	.....	50	.....	13	.....	.....	.....	.....	63	M	.....	70	110
.....	.....	360	.....	300	.....	83	.....	15¢	15¢	M	38	M	.....	60	120
15	14	235	.....	235	.....	100	.....	15¢	5¢	M	36	M	None	55	55
400	374	150	.....	.....	..	.....	.....	.....	.....	.....	28	.....	.. ...	40	80
40	24	200	....	200	.....	100	.....	20¢	10¢	M	43	.....	.....	45	90
90	70	400	10	10	10	3	100	25¢	8¢	M	35	M	.....	40	90
385	90	1,058	.....	759	.....	72	.....	20¢	8¢	MH	134	M	.....	65	110
125	63	475	4	200	4	42	100	40¢	40¢	M	82	M	None	65	140
100	74	550	4	550	4	100	100	15¢	25¢	H	43	M	$40	40	125
.....	.....	320	4	0	.....	.....	.....	.....	.....	.....	40	M	.....	70	150
400	83	1,252	4	1,200	4	96	100	40¢	3¢	M	110	M	$45	55	90
91	68	398	2	361	3	90	100	28¢	10¢	M	39	M	None	50	60
100	77	240	3	0	0	0	0	.....	.....	.....	24	MH	None	60	95
100	44	360	3	360	3	100	100	15¢	10¢	M	32	M	$40	50	105
20	13	101	.....	101	.....	100	.....	33¢	27¢	M	27	M	.....	58	58
100	36	520	.....	30	2	6	.....	60¢	20¢	M	51	M	.....	40	112
250	79	700	7	700	7	100	100	12¢	6¢	M	66	M	None	60	95
.....	.....	500	5	495	5	100	100	20¢	8¢	M	44	M	$50	55	107
255	150	500	0	500	0	100	0	18¢	.....	H	40	M	.....	65	125
100	98	268	1	200	1	75	100	15¢	15¢	M	24	M	.....	40	80
.....	.....	350	.....	350	.....	100	.....	55¢	.....	H	42	M	.....	50	100
.....	.....	.....	.....	.....	.....	.....	.....	$1	16¢	M	42	M	$36	45	90
150	43	700	0	700	.....	100	.....	30¢	30¢	M	112	M	$20	55	55
150	64	400	4	0	0	0	0	.....	.....	.....	38	M	.....	70	90
175	111	350	.....	.....	2	.....	.....	.....	.....	.....	52	....	.....	40	90
.....	.....	807	27	699	23	87	85	12¢	7¢	M	90	M	None	63	63
200	125	350	10	0	0	0	0	.....	.....	.....	65	M	$4	60	60
12	6	480	8	80	5	17	63	10¢	10¢	H	75	M	None	60	100
.....	.....	120	5	0	0	0	0	.....	.....	.....	17	M	.....	45	85
250	64	1,000	.....	300	.....	33	.....	.....	.....	.....	93	.....	.....	55	100
432	143	500	.....	400	2	80	.....	29¢	10¢	M	75	M	.....	45	75
140	53	450	50	200	25	45	50	27¢	7¢	MH	35	M	.....	70	70
.....	.....	250	.....	0	0	0	0	.....	.....	.....	20	M	.....	50	50
20	16	90	4	0	0	0	0	.....	.....	.....	11	M	.....	43	55
350	92	1,134	.....	1,008	.....	89	.....	.....	.....	.....	117	.....	.....	40	100
250	167	400	12	300	12	75	100	20¢	7¢	H	50	M	$40	80	80
75	75	370	.....	370	.....	100	.....	50¢	10¢	M	37	M	.....	50	125
100	44	428	4	325	4	76	100	30¢	10¢	M	40	M	None	40	100
200	226	325	3	1	1	0	33	33¢	.....	MH	29	M	.....	50	75
2	.....	35	0	0	0	0	0	.....	.....	.....	None	.....	.....	.....	.....
200	80	600	10	560	8	93	80	30¢	15¢	M	103	M	$20	55	85
10	10	210	1	0	0	0	0	.....	.....	.....	25	M	.....	50	125
300	178	550	4	36	4	7	100	25¢	12¢	MH	51	.....	.....	43	97
250	187	450	20	115	15	26	75	15¢	6¢	M	60	M	.....	60	100
73	45	300	.....	300	.....	100	.....	30¢	.....	M	33	M	.....	50	125
60	35	254	2	250	2	100	100	30¢	25¢	M	43	.....	.....	60	80
125	42	500	6	480	6	96	100	20¢	12¢	.....	67	M	None	63	63
10	7	100	10	2	.....	2	.....	.....	.....	M	.....	M	.....	40	60
45	41	112	.....	36	7	32	.....	50¢	20¢	H	21	M	.....	45	100
.....	.....	.....	.....	.....	.....	75	100	40¢	.....	M	16	M	.....	.....	.....
.....	.....	460	.....	437	.....	95	.....	23¢	8¢	M	85	M	$17.50	50	120
35	22	130	.....	130	.....	100	.....	30¢	30¢	H	27	M	.....	50	120
300	107	550	.....	.....	.....	.....	.....	.....	.....	.....	30	.....	.....	45	100
.....	.....	172	44	172	44	100	100	40¢	40¢	M	24	M	None	43	43
152	72	490	.....	425	.....	99	.....	40¢	11¢	H	50	M	$30	50	.....

Municipality Ownership of Water works	Population	Source		Storage	Filters	Sterilized	Distribution System			Pipe Sizes Inches		Pump Capacity m. g. d.	Main Supply Metered
		Type	Aver. Miles from City				Total Miles of Main	Kind of Pipe: Mains	Kind of Pipe: Services	Mains	Services		
MINN. (con.)													
Bird Island.....M	1,000	U	....	R	No	No	2.0	I	I	4–8	.....	0.1	No
Biwabik.....M	.....	....	1.5	RT	.....	.....	....	I	G	4–10	.....	0.7	...
Blue Earth.....M	2,568	U	0.0	RT	No	No	6.0	I	IL	4–10	.....	1.0	No
Bovey.....M	.....	U	1.0	T	No	No	....	IW	GL	4–8	¾	0.9	Yes
Breckenridge.....M	2,401	S	0.3	RT	A	Hy	3.5	I	IGL	4–8	⅝–2	0.5	No
Buffalo.....M	1,600	SU	0.0	T	.....	.....	5.0	I	GL	4–6	.....	0.2	No
Cannon Falls.....M	1,315	U	0.0	T	No	No	4.0	I	IL	4–8	.....	1.1	No
Cass Lake.....P	2,109	....	0.0	PpT	.....	No	2.0	I	G	4–10	½–2½	.....	No
Chaska.....M	1,966	U	0.0	R	.....	.....	13.5	I	.....	4–10	¾–3	0.5	...
Chatfield.....M	1,228	U	0.2	R	.....	.....	4.8	I	G	4–8	¾	0.4	No
Detroit.....M	3,426	S	1.0	Pp	.....	.....	5.0	.....	I	4–10	.....	0.7	...
East Grand Forks.....M	2,490	S	1.5	PpT	A	.....	8.0	I	L	6–10	.....	.....	Yes
Ellsworth.....M	1,000	U	0.5	R	.....	.....	0.8	I	G	4–6	.....	0.1	...
Excelsior.....M	1,015	S	0.5	....	A	Ch	3.0	I	G	4–8	.....	0.5	No
Fairmont.....M	4,630	S	1.0	T	.....	.....	12.0	I	GL	4–16	.....	2.3	...
Farmington.....M	1,449	U	0.0	Pp	.....	No	1.5	I	G	4–8	¾	0.6	No
Fertile.....M	800	U	....	RPp	.....	.....	1.5	.....	.....	4–8	.....	0.4	...
Fort Snelling.....M	1,800	S	15.0	Pp	.....	.....	4.6	I	G	2–8	.....	None	Yes
Fosston.....M	1,014	U	0.0	Pp	.....	.....	0.5	I	G	4–6	.....	0.4	...
Gaylord.....M	1,000	U	0.0	RPp	No	No	3.5	I	L	6–10	.....	0.9	No
Gilbert.....M	3,510	S	2.0	T	O	Ch	5.0	I	G	4–10	.....	1.9	Yes
Glencoe.....M	1,749	U	....	RPpT	No	No	5.3	I	L	2–12	⅝	1.2	No
Graceville.....M	1,022	U	0.0	Pp	.....	.....	3.0	I	G	4–8	.....	0.1	No
Grand Rapids.....M	2,914	SU	1.0	RT	.....	.....	7.5	I	G	4–8	.....	1.1	Yes
Granite Falls.....M	1,700	S	0.0	R	No	.....	4.0	I	.....	6–10	.....	0.5	No
Greenbush.....M	350	U	....	T	.....	.....	0.5	I	.....	4–8	.....	0.4	...
Harmony.....M	900	U	....	RT	No	No	1.7	I	G	6	½–¾	0.2	No
Henderson.....M	1,000	U	0.0	R	No	.....	3.0	.....	G	4–8	.....	0.2	No
Herman.....M	650	U	....	RPp	.....	No	1.3	I	L	4–8	.....	0.4	No
Hill City.....M	1,000	U	....	T	.....	.....	0.8	I	G	4–6	½–1	.....	No
Hopkins.....M	3,055	U	0.3	RPpT	No	.....	3.0	.....	I	4–8	.....	.....	No
Hutchinson.....M	3,750	U	0.1	T	No	No	11.0	I	GL	4–10	.....	1.8	No
International Falls.....M	3,448	S	0.5	RT	No	No	6.0	I	I	4–12	⅝–2	.....	Yes
Jordan.....M	1,300	U	0.0	RT	No	No	1.3	I	L	4–8	⅝–¾	0.1	Yes
Kenyon.....M	1,362	U	0.1	T	....	No	2.5	I	G	4–8	.....	0.2	No
Kiester.....M	275	U	0.1	T	No	No	0.8	I	GL	6–8	.....	0.09	No
Kinney.....M	1,275	....	0.0	PpT	O	.....	....	.....	G	6	2	0.2	...
Lake Benton.....M	1,000	U	0.3	R	No	No	4.0	I	G	4–8	¾–2½	0.7	No
Lake City.....M	2,846	U	0.0	R	No	No	26.0	I	G	4–12	.....	1.5	Yes
Lake Crystal.....M	1,204	U	0.0	Pp	No	No	3.2	I	I	4–8	4–8	0.3	No
Lakefield.....M	1,400	....	....	RT	No	No	3.0	I	L	4–8	¾–2	0.4	No
Lanesboro.....M	1,015	U	....	R	.....	Ch	2.5	I	.....	4–8	.....	0.4	No
Le Sueur.....M	1,795	U	....	Pp	.....	.....	5.0	I	GL	4–10	4–10	0.5	No
Litchfield.....M	2,790	U	0.0	Pp	.....	.....	3.5	I	G	4–8	¾–1¼	0.2	No
Luverne.....M	2,782	U	....	Pp	.....	.....	8.3	I	G	4–10	.....	0.2	No
Madison.....M	2,800	U	0.0	T	A	....	4.6	I	L	4–6	¾–1½	0.1	No
Mahnomen.....M	1,076	U	0.0	T	No	No	2.3	I	G	4–6	¾	0.2	No
Marshall.....M	3,092	U	....	RPp	.....	.....	10.0	I St	L	4–12	.....	0.2	No
Melrose.....M	2,529	S	0.0	T	.....	.....	2.5	I	GL	4–10	.....	1.0	...
Monticello.....M	1,024	U	....	....	No	No	1.8	.....	G	4–6	¾–2	0.9	No
Morris.....M	2,320	U	1.5	RT	No	No	7.5	I	L	3–10	.....	0.7	...
New Prague.....M	1,554	U	0.3	Pp	.....	.....	8.0	I	L	6–10	.....	0.1	No
New Richland.....M	1,000	U	0.0	PpT	No	No	2.5	I	G	4–8	.....	0.2	No
North Branch.....M	1,028	U	....	T	.....	.....	4.0	I	G	4–8	¾	0.8	No
Northfield.....M	4,023	U	....	R	.....	.....	12.3	I	L	4–12	.....	1.4	No
North Mankato.....M	2,500	U	0.5	R	No	.....	5.0	I	GL	4–10	½–⅝	0.6	No
Ortonville.....M	1,774	U	0.3	Pp	No	No	17.0	I	Wr L	4–8	¾	1.0	No
Park Rapids.....M	1,603	S	0.3	.....	.....	.....	3.5	I	G	6–10	.....	1.9	...
Perham.....M	1,370	U	0.0	R	No	.....	2.0	I	G	6	.....	0.7	No
Pipestone.....M	3,325	U	0.5	RPp	No	No	18.0	I	L	4–12	.....	2.5	Yes
Planeview.....M	1,370	U	0.0	RT	No	.....	6.0	I	G	4–8	¾	0.2	No
Redwood Falls.....M	2,421	U	1.0	RPp	.....	Ch	22.2	I	L	4–10	.....	1.5	No
Rush City.....M	1,000	U	....	T	.....	.....	3.0	I	GL	4–8	¾	0.8	No
Rushford.....M	1,142	U	....	.....	.....	.....	2.5	.....	G	4–8	.....	0.4	...
St. Peter.....M	4,400	U	....	T	.....	.....	6.8	I	GL	4–12	¾–2	0.9	No
Sandstone.....M	1,200	U	0.5	RPpT	No	No	4.0	I	.....	4–8	¾	1.2	No
Sauk Centre.....M	2,699	U	0.1	RPpT	No	No	4.0	1 St	G	4–12	.....	1.6	No
Sauk Rapids.....M	2,349	U	0.8	T	.....	.....	3.5	I	G	2–6	¾–1	0.2	No
Slayton.....M	1,045	U	0.3	RT	No	Ch	2.0	I	L	4–8	.....	0.6	Yes
Sleepy Eye.....M	2,449	U	....	RPp	No	.....	....	.....	.....	.....	.....	0.3	...
Springfield.....M	1,849	U	0.0	RPp	No	No	6.1	I	G	4–8	.....	1.3	No
Spring Valley.....M	1,871	U	0.3	RPp	.....	.....	5.0	I	.....	4–8	.....	1.0	No
Staples.....M	3,000	U	0.0	RPpT	.....	.....	6.0	I	G	2–10	.....	2.0	No
Thief River Falls.....M	4,685	SU	0.1	RPp	A	.....	9.0	I	GL	4–10	¾–2	4.3	No

Consumption		Number of Services		Number of Meters		Per Cent Metered		Meter Rates per 1,000 Gallons		Meters Owned by	Hydrants			Average Pressure lbs. per sq. in.	
Average Daily in 1,000 gals	Per Capita	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Max. Dom.	Min. Ind.		Number	Owned by	Aver. Rental each per year	Domestic	Fire
25	35	75	.....	75	.....	100	.....	40¢	25¢	H	18	M	.....	50	60
180	.....	400	.....	25	.....	63	.....	.....	15¢	M	20	M	$60	50	200
150	58	800	.....	800	.....	100	.....	30¢	30¢	H	72	M	$50	57	150
67	.....	300	.....	0	0	.....	.....	.....	.....	.....	17	M	None	.....	.....
20	8	300	.....	30	.....	10	.....	33¢	4¢	.....	60	.....	$5	40	90
70	44	105	30	.....	30	.....	100	.....	.....	H	34	M	.....	73	73
.....	.....	88	0	88	0	100	0	40¢	.....	H	17	M	None	65	75
100	48	250	3	63	3	25	100	33¢	33¢	P	22	P	.....	49	180
75	38	110	7	110	7	100	100	30¢	8¢	H	24	M	.....	60	60
90	73	300	.....	0	1	0	.....	.....	.....	.....	37	.....	.....	60	60
250	73	425	.....	425	.....	100	100	27¢	7¢	MH	71	M	$30	75	.....
130	52	400	2	360	2	90	100	67¢	18¢	H	60	M	None	70	90
.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	87	87
30	30	170	.....	170	.....	100	.....	15¢	15¢	H	28	.....	.....	60	150
800	173	695	.....	800	.....	100	.....	.....	.....	.....	96	M	$40	60	.....
40	28	200	.....	1	.....	.....	.....	.....	.....	.....	32	M	.....	45	75
.....	.....	72	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	47	110
400	222	118	.....	0	.....	0	.....	8¢	.....	M	48	M	.....	45	150
18	18	115	.....	115	.....	100	.....	.....	.....	.....	14	.....	.....	50	.....
40	40	136	.....	136	.....	100	.....	40¢	.....	M	40	M	.....	54	54
200	57	600	4	500	4	83	100	25¢	18¢	M	53	M	None	70	125
100	57	300	0	280	0	93	0	35¢	35¢	H	43	M	.....	65	125
.....	.....	150	.....	150	.....	100	.....	.....	.....	H	30	.....	.....	45	80
165	57	500	100	400	100	80	100	.....	.....	.....	80	.....	.....	55	100
60	35	173	7	173	7	100	100	28¢	.....	H	21	M	.....	85	85
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....
25	28	160	.....	5	.....	3	.....	$1	25¢	M	17	M	.....	60	60
25	25	60	.....	60	.....	100	.....	25¢	12¢	H	15	M	.....	87	87
20	31	100	12	10	12	10	100	$1	60¢	H	18	M	.....	50	50
5	5	60	.....	30	.....	50	.....	50¢	.....	H	10	M	.....	65	65
18	6	300	.....	300	.....	100	.....	15¢	.....	H	46	M	.....	60	60
100	27	415	6	415	5	100	85	25¢	.....	M	96	M	.....	70	110
400	116	900	5	900	5	100	100	.....	.....	M	85	M	$40	68	125
15	12	40	.....	40	.....	100	.....	40¢	20¢	H	14	M	.....	65	65
20	15	270	.....	270	.....	100	.....	50¢	15¢	H	31	M	None	45	45
22	.....	59	15	0	0	0	0	.....	.....	.....	7	M	None	.....	.....
160	125	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	M	.....	.....	125
.....	.....	82	.....	82	.....	100	.....	.....	.....	H	26	M	.....	93	125
200	70	500	.....	500	.....	89	.....	32¢	17¢	H	85	.....	.....	140	130
33	28	148	5	142	4	96	80	30¢	15¢	H	27	M	.....	60	200
.....	.....	.....	.....	.....	.....	.....	.....	50¢	20¢	M	30	M	None	55	100
25	25	150	6	35	6	23	100	35¢	10¢	H	13	.....	.....	95	68
100	56	400	.....	500	.....	100	.....	20¢	10¢	H	54	.....	.....	40	70
160	54	300	100	300	100	100	100	$2.25	$1.13	H	39	.....	.....	55	125
.....	.....	250	.....	250	.....	100	.....	$1.34	13¢	M	60	M	.....	60	.....
62	22	250	.....	250	.....	100	.....	60¢	.....	M	45	M	None	55	113
8	7	115	.....	115	.....	100	.....	$1	.....	H	26	M	.....	55	55
95	31	200	.....	200	.....	100	.....	40¢	.....	H	62	M	.....	50	80
250	99	400	.....	400	.....	100	.....	27¢	13¢	H	32	.....	.....	60	150
45	44	180	.....	180	.....	100	.....	30¢	20¢	M	21	M	.....	50	65
350	151	500	.....	500	.....	100	.....	$2	12¢	H	63	.....	.....	60	100
40	36	155	7	155	7	100	100	50¢	20¢	M	30	M	.....	50	70
12	12	120	2	125	2	100	100	40¢	25¢	H	22	M	None	45	45
.....	.....	65	2	65	1	100	50	25¢	10¢	M	50	M	None	45	.....
300	75	825	2	827	.....	100	.....	17¢	7¢	H	125	M	.....	75	90
60	24	400	20	400	20	100	100	15¢	15¢	H	20	M	.....	60	60
45	25	225	.....	225	.....	100	.....	.....	.....	H	37	M	$15	70	70
.....	.....	300	.....	0	.....	0	.....	.....	.....	M	32	M	.....	40	150
75	55	90	3	90	3	100	100	$1	$1	M	14	M	None	45	90
130	39	929	.....	725	.....	78	.....	$1	30¢	H	105	M	None	55	120
60	44	390	10	390	10	100	100	75¢	60¢	H	40	M	None	43	43
260	107	650	.....	650	.....	100	100	40¢	13¢	H	88	M	.....	50	50
30	30	75	.....	75	.....	100	.....	25¢	35¢	H	42	M	$8	50	120
.....	.....	35	.....	.....	.....	.....	.....	.....	.....	.....	24	.....	.....	.....	168
110	25	378	.....	378	.....	100	.....	30¢	15¢	MH	44	M	$50	84	84
.....	.....	244	5	1	3	.....	60	15¢	8¢	H	29	M	.....	60	95
.....	.....	475	5	475	.....	100	.....	40¢	10¢	M	62	M	$40	60	102
52	22	266	6	266	6	100	100	30¢	.....	H	29	M	.....	75	75
40	38	250	.....	225	.....	90	.....	50¢	20¢	M	25	M	.....	40	90
100	41	221	.....	221	.....	100	.....	45¢	45¢	H	50	M	$45	45	160
55	30	348	3	348	.....	100	.....	40¢	40¢	H	60	M	.....	67	75
250	134	114	.....	114	.....	100	.....	.....	.....	M	34	M	.....	60	100
75	25	285	.....	285	.....	100	.....	40¢	.....	H	64	M	$20	53	85
250	53	525	10	525	10	100	100	50¢	1¢	H	72	M	$40 50	55	100

Municipality Ownership of Water works	Population	Source Type	Source Aver. Miles from City	Storage	Filters	Sterilized	Distribution System Total Miles of Main	Distribution System Kind of Pipe Mains	Distribution System Kind of Pipe Services	Pipe Sizes Inches Mains	Pipe Sizes Inches Services	Pump Capacity m. g. d.	Main Supply Metered
MINNESOTA (CON.)													
Tracy.....P	2,463	U	....	RPp	No	No	4.0	I	.....	4–10	.....	0.4	Yes
Two Harbors.....M	4,546	S	0.5	Pp	No	Ch	6.0	I	G	4–12	¾	3.0	No
Wabasha.....M	2,249	U	....	RPp	No	No	3.0	I	I	6–12	½–2	0.6	No
Wadena.....M	2,186	U	2.0	RPpT	Aı	No	12.0	I	Lİ	4–10	.....	0.3	...
Wanda.....M	200	U	..	RPpT	No	.....	0.5	I	G	12	.....	0.6	No
Warren.....M	1,772	U	....	Pp	No	No	2.0	I	G	3–8	.....	0.08	No
Warroad.....M	.....	S	0.1	T	.....	.....	0.3	I	GL	4–8	¾	0.9	No
Waseca.....M	3,908	U	0.2	Pp	No	.....	6.5	I	GL	4–12	.....	1.5	No
West Minneapolis.....M	3,055	U	....	RT	.....	.....	3.0	I	.....	4–8	.....	0.4	No
Wheaton.....M	1,337	U	0.5	T	No	No	4.5	I	L	4–6	.....	0.2	...
White Bear Lake.....M	2,022	U	0.0	T	No	No	....	.....	G	1–6	¾–1	.....	No
Winnebago.....M	1,641	U	....	RT	No	.....	3.5	I	I	4–8	.....	1.0	Yes
Winthrop.....M	1,147	U	....	R	.....	.....	1.5	.....	G	4–8	.....	.....	Yes
Wolverton.....M	200	U	....	.....	.....	.....	....	.....	.....	.....	.....	.....	No
Worthington.....M	3,481	U	0.5	No	No	No	5.0	I	IG	4–8	1–2	1.0	No
Zumbrota.....M	1,265	U	0.0	R	No	No	5.0	I	GL	6–8	.....	0.05	No
MISSISSIPPI													
Ackerman.....M	1,800	U	1.3	RT	No	No	7.0	I	G	2½–10	.....	0.5	No
Amory.....M	2,861	U	0.0	RPp	.....	.....	7.0	I	G	4–10	.....	0.7	No
Bay St. Louis.....M	4,000	U	0.0	RT	No	No	12.0	I St	I Wr	2–8	2–8	.....	No
Brookhaven.....M	4,706	U	0.5	RPp	No	.....	8.0	I	G	4–10	.....	2.9	No
Charleston.....M	4,000	U	0.0	RT	No	.....	6.0	I	G	½–2	.....	1.2	No
Cleveland.....M	2,500	U	0.0	RT	No	No	7.5	I St	G	4–10	½–1	2.2	No
Collins.....M	1,500	U	....	R	No	.....	4.0	I	G	4	½–1½	1.4	No
Columbia.....M	2,826	U	0.0	RPp	.....	.....	6.0	I	.....	4–10	.....	1.1	...
Crystal Springs.....M	1,343	U	0.0	RT	No	No	5.0	I	.....	4–8	¾–6	0.5	No
Durant.....M	1,850	U	....	RT	No	.....	...	I	G	6–10	¾	1.2	No
Ellisville.....M	1,681	U	0.8	RPp	.....	.....	4.0	I	G	4–8	.....	0.5	...
Forest.....M	1,400	U	0.5	RT	No	No	5.0	I	G	1¼–6	¾–1	0.2	No
Gloster.....M	1,486	U	0.3	Pp	.....	.....	5.0	I	.....	4–8	.....	0.2	...
Hazlehurst.....M	2,056	U	0.0	RPp	No	No	4.0	I St	G	2½–10	.....	0.7	No
Indianola.....M	.....	U	0.0	R	No	No	3.0	I	.....	4–8	¾	0.4	...
Lambert.....M	1,000	U	....	RT	No	No	6.0	St	G	¾–6	¾	1.7	No
Lexington.....M	2,428	U	0.3	RPp	.....	Ch	6.0	I	I	6–10	.....	1.4	No
New Albany.....M	2,531	U	0.0	RPp	.....	.....	2.5	.....	.....	6–8	.....	0.3	No
Okalona.....M	4,000	U	0.3	R	No	No	5.0	I St	.....	1–8	½–¾	2.9	No
Oxford.....M	2,150	U	....	RPp	.....	.....	6.0	I	G	4–8	.....	0.7	...
Pass Christian.....M	2,357	U	....	No	No	.....	9.0	I St	G	2	¾	None	No
Philadelphia.....M	3,000	U	0.3	RT	No	No	....	.....	G	3–6	½–¾	0.05	No
Pontotoc.....M	1,500	U	0.3	RT	No	Nó	5.0	I St	G	1–8	½–¾	1.4	No
Poplarville.....P	1,500	U	0.0	RT	No	.....	5.0	I	G	2–8	.....	0.9	No
Rosedale.....M	1,103	U	0.0	RPpT	No	No	5.0	I	G	4–6	¾	0.7	No
Sardis.....M	1,406	U	0.0	RPpT	No	.....	6.0	I	G	¾–6	¾	0.7	No
Senatobia.....M	1,275	U	....	RT	No	No	5.2	I	St	2–8	½–4	0.7	No
Shaw.....M	1,500	U	0.0	RT	No	No	2.0	I St	G	2–8	½–1¼	0.6	No
Tylertown.....P	1,000	U	0.0	T	No	.....	3.0	I St	G	1–6	¾	0.5	No
Wesson.....M	890	U	0.3	RT	.....	.....	1.5	I	G	2–6	.....	.....	No
Winona.....M	2,572	U	0.5	R	No	No	8.0	I	G	4–12	.....	1.1	No
MISSOURI													
Anderson.....M	1,000	U	0.0	R	No	.....	3.5	I St	G	½–6	½–1	0.05	No
Bethany.....M	2,060	S	0.5	RPp	A	Ch	7.0	I	GL	3–8	.....	0.7	No
Bonne Terre.....P	4,500	U	2.0	R	No	No	16.0	I	GL	4–12	¾	1.1	No
Brunswick.....P	2,000	U	0.2	Pp	O	Ch	1.5	I	Wr	4–8	½–¾	0.1	No
California.....M	2,218	U	0.0	T	No	.....	3.0	I	G	4–8	¼–4	0.14	No
Cameron.....M	3,248	S	1.5	RPp	A	Ch	6.5	I	G	4–12	.....	0.7	No
Campbell.....M	2,025	U	....	RT	No	.....	7.0	I St	G	2–8	.....	1.0	No
Canton.....M	2,769	U	0.5	Pp	...	.....	3.0	I	.....	4–6	.....	0.4	...
Chaffee.....M	3,035	U	0.0	RPpT	No	No	3.0	I	.....	¾	.....	0.4	No
Charleston.....M	3,800	U	..	Pp	No	No	8.5	I	G	4–8	¾–1½	1.2	Yes
Concordia.....M	1,200	U	0.0	T	No	.....	1.9	I	G	4–6	.....	0.1	No
Doniphan.....M	2,402	U	0.3	Pp	No	No	3.0	I	G	4–5	.....	1.4	No
Edina.....M	1,562	S	0.5	T	A	.....	4.0	I	GL	4–6	½–2	3.0	Yes
Excelsior Springs.....P	4,165	U	7.0	RPp	.....	.....	.....	.....	G	2–10	¾–1½	2.0	No
Fayette.....M	2,381	S	3.0	Pp	No	Ch	10.0	IW	G	4–8	¾–2	0.6	No
Festus.....M	4,200	U	0.3	R	No	.....	9.0	I	G	4–10	.....	0.6	No
Glasgow.....M	1,507	S	0.1	RPp	A	.....	2.0	I	G	4–8	.....	0.5	Yes
Higginsville.....M	2,964	U	0.3	R	.....	.....	3.5	I	G	3–8	½–2	0.2	Yes
Huntsville.....M	2,126	U	0.3	T	.....	.....	4.0	I	G	4–8	¾	0.3	No
Jackson.....M	2,114	U	0.3	R	.....	.....	4.0	I	G	4–10	½–6	0.08	No
Kahoka.....M	1,758	U	....	Pp	.....	.....	4.0	I	G	4–8	.....	0.8	No
Lamar.....M	2,255	SU	2.0	RPp	.....	Ch	8.0	I	IG	4–8	.....	4.0	No
Lees Summit.....M	1,455	SU	20.0	RPp	.....	.....	9.0	GI	GL	2–8	¾–2	.....	Yes
Liberty.....M	3,097	U	3.5	T	A	Ch	9.5	I	GL	4–8	¾	2.2	Yes
Macon.....M	3,549	S	2.0	RPp	A	.....	7.0	I	GL	3–10	.....	1.5	No

Consumption		Number of Services		Number of Meters		Per Cent Metered		Meter Rates per 1,000 Gallons		Meters Owned by	Hydrants			Average Pressure lbs. per sq. in.	
Average Daily in 1,000 gals	Per Capita	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Max. Dom.	Min. Ind.		Number	Owned by	Aver. Rental each per year	Domestic	Fire
18	7	575	.....	300	.....	52	.....	$40	.....	P	38	P	$52.40	60	60
1,300	286	500	1	0	4	0	100	.....	7¢	P	31	M	None	80	150
100	45	250	.....	249	.....	100	.....	40¢	15¢	H	40	M	None	80	80
100	45	225	.....	225	.....	100	.....	.....	.....	.....	73	M	.....	40	125
3	15	30	.....	30	.....	100	.....	50¢	45¢	H	5	M	.....	.....	75
60	34	380	.....	200	.....	53	.....	52¢	33.5¢	M	34	M	.....	45	45
100	.....	20	1	0	0	0	0	.....	.....	.....	7	M	.....	48	70
100	26	850	.....	750	.....	88	.....	30¢	30¢	H	109	M	None	45	75
35	11	310	.....	310	.....	100	.....	15¢	.....	H	46	.....	.....	60	.....
20	15	194	41	194	41	100	100	$1.20	54¢	H	54	M	.....	50	55
12	6	300	100	300	100	100	100	27¢	16¢	H	63	M	.....	55	55
75	46	435	6	424	6	98	100	30¢	30¢	H	45	M	.....	40	110
36	31	.....	.....	105	.....	.....	.....	30¢	15¢	H	24	M	.....	45	200
1	5	33	.....	33	.....	100	.....	$1	50¢	H	.....	.....	.....	.....	.....
360	103	600	.....	56	.....	10	.....	5¢	3¢	MH	42	M	$40	65	100
25	20	209	.....	208	.....	100	.....	.....	.....	.....	38	M	$35	68	68
150	83	150	50	140	50	93	100	$1	50¢	H	60	M	None	45	125
150	57	625	.....	625	.....	100	.....	35¢	20¢	M	68	M	.....	65	100
300	75	950	.....	1	.....	.....	.....	15¢	15¢	M	70	M	.....	45	100
300	64	700	8	650	8	93	100	30¢	15¢	M	96	M	None	45	140
150	38	400	.....	300	.....	75	.....	20¢	.....	H	40	M	.....	40	100
250	100	437	.....	312	.....	71	.....	$1	40¢	M	75	M	.....	50	100
90	60	200	4	.....	4	.....	100	.....	25¢	M	25	M	None	55	100
250	89	.....	.....	25	.....	.....	.....	.....	.....	.....	52	.....	.....	60	125
250	186	478	10	.....	.....	.....	.....	.....	.....	.....	61	M	.....	65	150
40	22	100	1	100	1	100	100	33¢	9¢	H	42	M	None	55	120
30	18	238	.....	100	.....	42	.....	25¢	.....	M	31	.....	.....	53	120
150	107	300	50	0	2	0	4	50¢	50¢	H	15	M	.....	40	80
70	47	120	.....	5	.....	4	.....	23¢	.....	M	32	.....	.....	55	55
150	73	275	15	225	15	82	100	30¢	20¢	M	44	M	.....	60	125
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
100	100	200	4	0	0	0	0	.. ..	.....	.....	7	M	.....	50	50
185	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	.....	.....	60	125
275	109	550	.....	450	.....	82	.....	25¢	25¢	M	27	M	.....	60	100
250	63	450	.....	375	.....	83	.....	50¢	25¢	M	55	M	None	50	90
150	70	400	.....	250	5	63	.....	50¢	40¢	M	90	M	.....	40	75
.....	.....	400	.....	0	0	0	0	.....	.....	.....	25	M	.....	15	.....
138	46	340	.....	270	.....	79	.....	$1	.....	M	36	M	.....	60	200
22	15	130	15	125	15	96	100	50¢	50¢	M	13	M	$19.25	60	60
150	100	180	25	40	25	22	100	30¢	15¢	P	20	P	None	50	120
40	36	250	4	125	4	50	100	30¢	10¢	H	23	M	$50	45	125
120	85	250	6	0	4	0	67	.....	20¢	M	32	M	None	43	60
50	39	250	.....	142	.....	56	.....	40¢	25¢	M	22	M	.....	30	80
300	200	200	3	0	0	0	0	.....	.....	.....	22	M	.....	50	50
65	65	150	2	25	1	17	50	30¢	15¢	P	3	P	None	45	85
50	56	25	8	25	8	100	100	40¢	35¢	P	14	M	.....	50	50
150	58	450	.....	435	.....	100	100	30¢	10¢	M	60	M	$17.40	80	115
60	60	200	3	20	2	10	67	25¢	25¢	H	7	M	.....	45	70
125	60	228	.....	228	.....	100	100	60¢	25¢	H	39	M	None	77	125
540	120	1,000	50	0	0	0	0	.....	.....	.....	113	P	None	55	55
70	35	120	55	120	55	100	100	.....	.....	P	17	P	$13.65	75	81
90	41	250	7	250	7	100	100	33¢	18¢	M	56	M	.....	45	45
160	49	536	.....	536	.....	100	100	.....	.....	.....	73	M	.....	50	100
40	20	195	.....	233	.....	100	.....	50¢	50¢	H	32	M	.....	65	65
.....	.....	.....	.....	175	.....	.....	.....	.....	.....	.....	85	M	.....	60	90
50	17	225	6	20	.....	9	.....	35¢	15¢	M	23	M	None	55	100
100	26	400	10	0	0	0	0	.....	.....	.....	82	M	.....	40	150
20	17	90	10	90	10	100	100	50¢	40¢	H	19	M	.....	50	50
42	18	200	100	75	10	38	10	.....	.....	H	60	M	.....	90	120
.....	.....	46	2	46	2	100	100	60¢	20¢	H	.....	M	.....	60	110
400	96	1,400	.....	1,150	.....	82	.....	50¢	.....	P	75	P	$4.72	60	60
100	42	316	.....	300	.....	95	.....	$1	20¢	H	75	M	None	75	120
.....	.....	.....	.....	.....	.....	100	100	50¢	30¢	H	91	M	.....	60	.....
50	33	130	.....	130	.....	100	100	75¢	.....	H	30	M	$30	82	103
75	25	326	.....	225	.....	69	.....	67¢	.....	M	42	.....	.....	70	100
25	12	140	5	60	5	43	100	60¢	60¢	M	30	M	.....	75	75
.....	.....	300	8	300	8	100	100	60¢	60¢	H	40	M	$40	.....	.....
50	29	50	.....	20	.....	40	.....	.....	.....	.....	26	M	.....	30	77
85	38	260	.....	210	.....	81	.....	45¢	18¢	M	76	M	$40	60	120
60	41	290	2	290	2	100	100	50¢	14¢	H	40	M	.....	60	95
280	91	800	5	800	5	100	100	40¢	25¢	H	87	M	$25	85	200
500	141	462	.....	200	.....	43	.....	35¢	25¢	H	75	M	.....	50	.....

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Slipshod Versus Good Plans and Specifications for Roads

By Don Heaton
County Engineer, Benton County, Indiana

THERE is a very close relation between road plans and road contractors: poor plans attract a poor class of bidders, and good plans attract a good class of bidders. As a rule, poor plans are more flexible and more liable to substitution than good plans. The specifications accompanying poor plans are invariably indefinite, and very often some detail of the work could be built in two or three different ways and still be in accordance with the plans and specifications as written.

The unscrupulous contractor that is in the habit of slighting work and interpreting indefinite provisions of the plans to his own benefit, enjoys arriving at a letting and finding a poor set of road plans. He is quick to see loopholes and possibilities of inferior substitutions, and makes his bid accordingly. He has some right to assume, too, that if plans are prepared in a slipshod manner, the construction can be handled in the same way. Good plans always command respect and inspire confidence. The first-class contractor that is in business to stay and that likes to leave a good record wherever he works does not care for this kind of competition and naturally seeks localities where plans are prepared in such a manner that the hard-working and conscientious bidder has a fair chance.

How Do You Draw Your Plans and Specifications?

Most of our county highways are built by contract. The value of any highway contract is in direct proportion to the value of the plans and specifications, for they are the part of the contract that sets out what is to be done and how it is to be done. If the plans are indefinite and do not clearly set forth the requirements and conditions for the construction of the improvement, the value of the improvement to the taxing district that is paying for the road is much less than it would be if all the provisions of the contract were clearly stated.

Surveys

The survey is made for the purpose of getting information in the field and includes the actual location of all physical and topographical features that may affect the improvement. Part of this information is obtained with instruments such as the level, transit and tape, and part by personal observation. The principal work to be accomplished in a survey is the location of the center line of the proposed road and the taking of levels to find the difference of elevation of points along and adjacent to this center line.

As a rule, country roads in the United States outside of New England are located along section or fractional section lines. No time should be spared in making the survey to get the center line of the proposed road properly located. This is the keynote of the whole survey. Everything else depends upon it. Personally, I spend three or four days a week, if necessary, hunting corner-stones and other monuments that determine the proper and legal locations of the proposed improvement. It is important that the plans be based upon the same center line as the one used in construction. Do not take cross-sections from one center line and set slope-stakes from another.

Very often there will be fences within the highway location that must be moved. The proper location of the center line at the start of the survey will save much trouble and annoyance about property lines later on. If the line is established by existing corner-stones and legal monuments, there is seldom any complaint by the landowner when he is ordered to move his fence.

Once the ruling points and the center line are established, the next work is to run the transit line. Set station stakes and take note of topography far enough on each side of the center line to include all territory likely to be affected by the improvement. The ruling points in the line having been located, the transit is set over the first hub stake or corner-stone and sighted to the nearest stake or corner-stone on the line of the road. The bearing of this line

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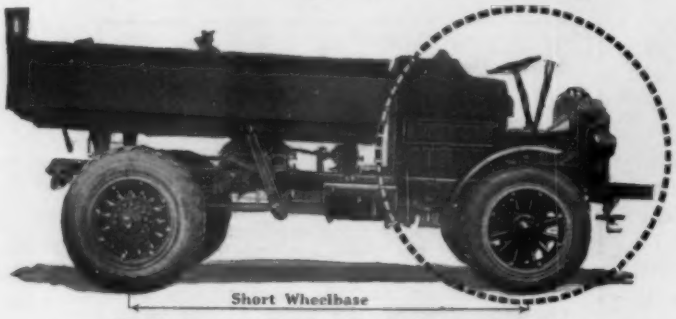

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is noted and also its deflection from an intersecting road at this point, if there happens to be one. Successive points of the center line at each station are now obtained by signals to the head flagman, who places his flagpole at the various points. If a cross-section party is following the transit party, it is common practice, not to drive stakes at each 100 feet, but to drive a small nail with a piece of red cloth attached to it on the center line at each station. These are easily found by the level party, and save driving stakes until construction is started.

If the levels are to be taken at some later time, stakes are set at such a distance from the center line that they will not be broken or disturbed by traffic on the road. On these stakes must be marked the station number and the distance to the established center line.

After one-quarter or half a mile of stakes are set, the transit is moved up to the next hub stake, sighted to the point just left, and sighted to the next corner-stone or hub ahead. The deflection between these two lines is noted, also the bearing of the line, the station number, and the distance from the last transit point.

When the head flagman comes to a bridge, he takes points on the line at each end of the span and records in a note-book the station number of each end of the span, as well as the distance from the center line of the road to the center line of the bridge. The locations of all buildings along the road are obtained by measurement, and the station numbers of all fences, both property line and field fences, are noted. The direction and location of watercourses, both open and tiled, are also noted on the transit book map.

After the transit line is run and the topography taken, the cross-section and the center-line levels are obtained. A cross-section party usually consists of four men, namely, a leveler, a rodman and two chainmen. In doing this work, one chainman goes to the station stake and notes the distance marked upon the stake to the center line of the road as established by the transit party. Using this distance, the zero end of the tape is placed on the center line and the tape stretched across one-half of the highway. With the tape in this position, the rodman gives the center line reading and then walks along the tape, selecting points that will give a good representation of the ground surface. As the rod is held and read at each point, the rodman calls out the distance of each point from the center line for the leveler to place in the note-book. The tape is then stretched across the opposite half of the highway, and the operation is repeated. Where the route of the road is over the location of an already established highway, it requires from seven to nine level readings to obtain a representative cross-section. On new locations and fairly level ground, this number may be materially reduced.

With the transit and level work completed, the scene of operation is shifted to the office. Before starting the office work, it is generally a good plan to decide upon the form and general make-up of the completed set of plans. Are you going to have a profile several feet long, or are you going to use small sheets of paper with several profile lines upon each sheet? Will the cross-section sheet and the bridge-plan sheets all be of the same size? These are some of the things you will have to decide upon, and these questions are easily decided if you use the sheets designated by the Federal Office of Public Roads. These sheets are of the plan-profile type and of such a size that when bound together they are easily handled. The size of the border line on each sheet is 22 x 33½ inches, so that 3,200 feet of road can be placed on one sheet to a scale of 1 inch to 100 feet.

In addition to plan and profile sheets, the plans will contain a title sheet which should show a general layout of the improvement and immediate vicinity. Bridge drawings and cross-sections are made upon sheets that conform to the size of the plan-profile sheets, and they all are bound together when finished.

In plotting the line, there are two or three methods in common use. The most common is to plot the different tangents by means of a protractor and scale. Another method often used is the tangent method, in which the line of each tangent is produced and offsets from this line computed.

The profile is plotted just below the plan. Stations are marked off on the horizontal line corresponding to the same stations upon the plan. The ground or surface lines shown on the profile should represent the center line of the new improvement. The horizontal scale of the profile—usually 1 inch equals 100 feet—is also used in making the plan. The horizontal scale of the profile is 100 feet to the inch, and the vertical scale should usually be about 10 feet to the inch.

In addition to the center line the profile should show the grade of the new road, together with elevations of grade points and elevations of grade of each 100 feet. It should describe and give the elevation of all bench-marks. The elevation of all drainage structures and the flow lines of all intersecting drains, either

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open or tile, should be shown on the profile.

A convenient scale of plotting cross-sections is 1 inch to 5 feet. In plotting cross-sections, the horizontal and vertical scales are the same.

With the plan, profile and cross-sections plotted, the next step is to establish the grade of the new road. Whenever possible, it is important that the grade of the road be so established, that the amount of excavation and embankment will be about the same, without excessive and expensive haul. In my opinion, the most monotonous job involved in preparing a set of road plans is to establish a grade line that will balance the volume of cut and fill, but I firmly believe that the extra work required in the office is fully justified by better construction and lower and more intelligent bidding. The operations are about as follows: Having decided upon the cross-section of the new road, a cardboard template of this section is made to the same scale as that of the plotted cross-sections. A trial grade line, say 500 or 1,000 feet long, is established by inspection, and the grade elevation at each station is computed. These grade elevations are marked upon the cross-sections. The template of the new roadway is then centered upon the cross-sections at the elevation of the new grade throughout the length of the trial grade line, and a pencil is run around the template to outline the proposed roadway. After this operation is completed, you have an outline of both the new road and the old road at each 100 feet of the trial grade. Sometimes these two outlines will be very close together and at other times they will be widely separated, depending upon to what extent the new grade conforms to the existing grade. The volume between these two outlines represents the area for obtaining volume of cut, or the area for obtaining volume of fill. These areas are usually mixed at each station, part representing fill and part representing cut.

The next step is to compute the area of the cut and fill sections. This can be done by dividing the irregular areas into regular geometrical forms, such as rectangles, triangles and trapezoids, and computing the area of each small figure. A much faster method, and one that is usually within the required degree of accuracy, is to use a planimeter for obtaining the areas.

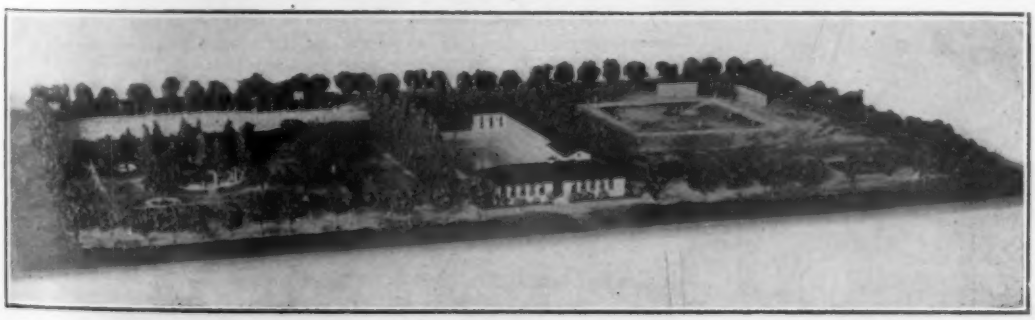
The areas of cut and fill are figured separately, and the average end area for any station, multiplied by 100 and divided by 27, gives the volume of cut or fill for that station in cubic yards. If the volumes of cut and fill do not balance, a new trial grade is established and the operation repeated until the excavation and embankment are about the same.

Conclusion

In the foregoing paragraphs I have endeavored to outline the essential operations involved in the preparation of a set of county road plans. Many of the details I have not attempted to discuss, such as location curves and vertical curves, or shrinkage, bridge plans and so forth. It pays to spend a good deal of time in drafting, in lettering, and in making plans neat. There is nothing that helps a set of plans more than good lettering. If you cannot letter yourself, hire someone who can.

ACKNOWLEDGMENT.—From a paper read before the Eleventh Annual Road School at Purdue University, Lafayette, Ind.

Playground Model Available as Loan Exhibit



This miniature model, constructed for the Children's Bureau of the U. S. Department of Labor, is an exact reproduction to scale of a 5-acre playground adequately equipped for daily use by approximately 300 boys and girls. It contains a miniature swimming pool, a shelter-house, two tennis courts, a basket-ball court, a large baseball diamond, a smaller diamond, a wading pool for little children, seats for the story hour, swings, ladders, flying rings, sand-boxes, and all other needed equipment. Tiny figures of children engaged in the various sports are part of the model. The model is on permanent display at the Children's Bureau in Washington, and will be available for loan to important child-welfare conferences or exhibitions

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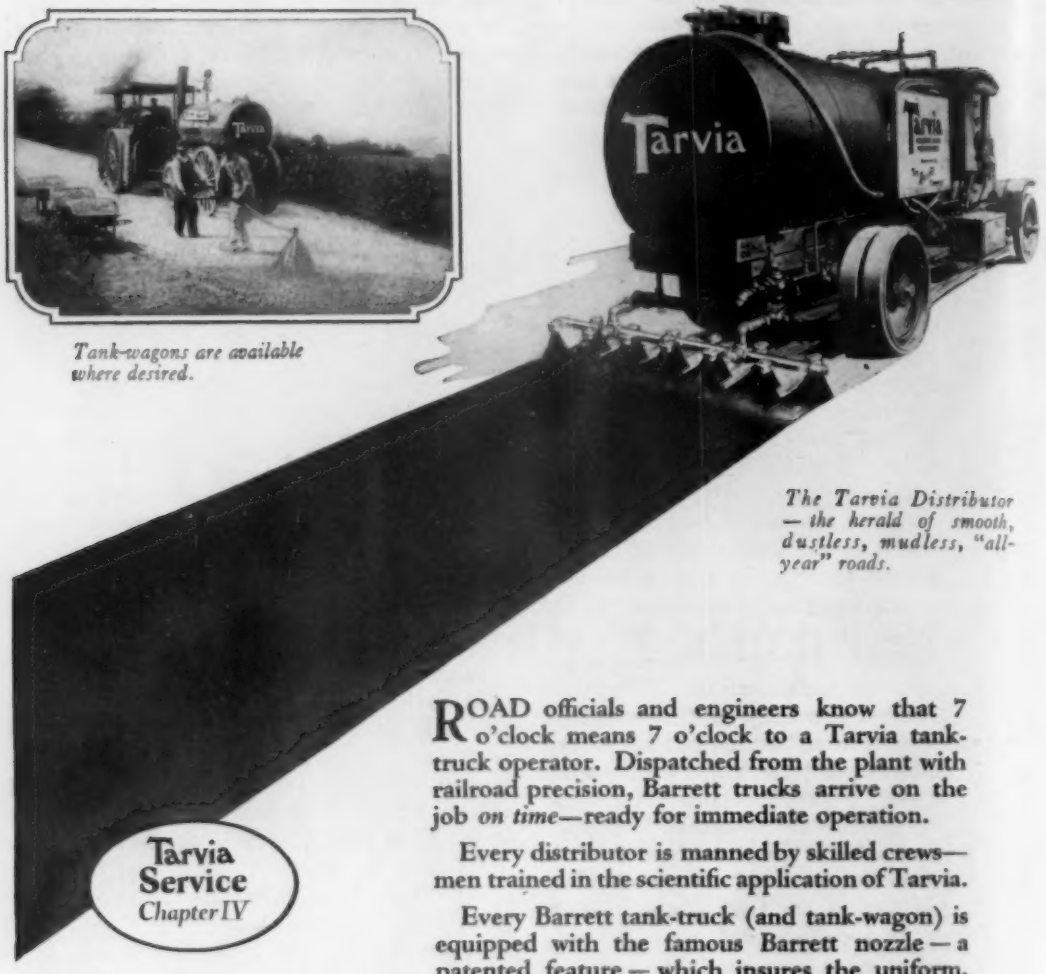

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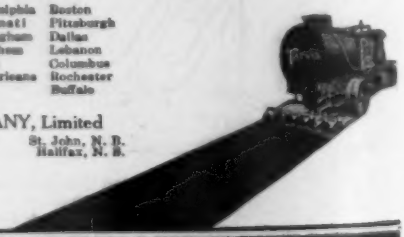


From the International Union of Cities

Items translated from "Tablettes Documentaires Municipales" by Stephen Child, 410 Maryland Building, Washington, D. C., to whom requests for further information regarding this source of civic documentation should be addressed

The Extension of Paris, France. 71.31 (44.361)

The Department of the Seine exercises authority over the development of the great Parisian agglomeration by means of its control of transportation problems that are communal and especially by its power to purchase lands; it owns at the present time the Parc de Sceaux, which is destined to serve as a promenade and open verdurous space; also the broad lawns of Avron at Rosny-sous-Bois, where there will probably be created a garden city; lands to the northeast of the city, to be developed for homes for 70,000 people. A competition for plans for this area is now under way. The Department is also negotiating for the purchase of condemned forts of the second line of defense.

City Plans for Stockholm, Sweden. 71.31 (487.1)

Since the introduction of the new Swedish law in regard to city planning, there has been a great increase in interest in the subject and its problems. Stockholm at the present time maintains an official permanent special department of city planning, to which all plans for the rearrangement of the city must be referred. Such plans are now being prepared for various districts of the city. In order to satisfy the increasing needs of traffic, a new artery has been created—"Kungsgatan"—which is to be 24 metres in width. The unity or harmony which is being realized in the buildings along this new avenue gives it an architectural character of the best sort, especially from the point of view of the aspect of the avenue as a whole. As a result of the opportune purchase of building land, the city is assured an influence in regard to the ultimate arrangement of buildings. It is interesting to note that, at one of the crossings of Kungsgatan by an important street, two flanking buildings with towers have been erected with the effect of giving to the ensemble an architectonic solution. There are also sections of the city, in one of the most beautiful parts of Stockholm, to be devoted to detached houses, in regard to the planning of which the city has also exercised an active control, in order to obtain along the river shore an artistic sky-line.

Housing Colonies in Holland. 71.43:72 (492)

What may be termed prototypes of the best architecture of Holland are to be found at the autonomous garden city of Hilversum, near Amsterdam. This already includes a population of 44,000. Then there is the garden city of Vreewijk near Rotterdam, a colony for workers in the Port of Rotterdam and near-by shipyards.

Aerial Photography in Germany. (77.03:62.913.52) 71.43

The significance and importance of aerial photography in helping to solve problems of construction and city planning are being fully realized in Germany. It facilitates the study of the ground and the elaboration of plans; it permits easily and perfectly the adaptation of building blocks to inequalities of ground. The adaptation to their surroundings of some of the older cities of Germany is notable, and study of these by aerial photography enables modern art to be inspired by these older models; enables also the more esthetic development of new portions of towns.

City Planning Laws in Prussia, Germany. 71.31:35 (43)

City planning legislation recently enacted for Prussia has at the suggestion of the Prussian Minister of Social Health been submitted to the Germany Public Academy of City Planning, for its examination, and its advice has been asked concerning a projected law relating to the planning for and the construction of housing colonies and groups of row houses. The Academy examined all these proposals and has just presented to the Minister a report suggesting amendments. This report makes clear that before preparing construction plans it is expedient to determine a general plan of the needs of an economic region, without being concerned with municipal limits. In order to prevent building plans from being inopportune, decisions should be made in regard to ways of communication. It will be convenient to provide in advance in the general plan for the needs of the region for what is called "Verkehrsbander"—bands or more or less broad strips of ground where will be established in the future means of communication of all sorts. These so-called bands or strips should figure in construction plans exactly as other means of communication. The new law should, according to the proposals of the Academy, include the following divisions: (1) a general plan of the needs of the city and its surroundings; (2) a plan for the development of districts and the alignment of streets; (3) the subdivision into lots and the adaptation of these to the ground; (4) building regulations; (5) intercommunal cooperation; (6) cooperation in regard to general legislation. Besides all this, the Academy of City Planning and the following associations have been invited to present in the near future a report concerning the proposed city planning laws: The Prussian Union of Cities; The Union of Higher Technical Officials of the Cities of Germany; The Germany League for Public Health.

Increased Water-Supply for Paris, France. 62.811.31 (44.361)

The water-supply for Paris is to be increased by 80,000 cubic metres as a result of the Voulzie aqueduct, which is about completed. This aqueduct brings the water from the Voulzie and the Dutrient. The water in these two streams is impounded near their source in Provins and brought in reinforced conduits to Longueville, where a pumping plant lifts the water 66 metres into another conduit of cast iron, 1.25 metres in diameter. This extends for about 28 miles to the large aqueduct of Loing and Lunain. This latter is some 57 miles in length. An aqueduct and special pumping plant have been built to renew the supply of water of the Seine that has been taken from the above-mentioned sources. Water is taken into the Seine at Bray. The pumping plant at Ormes lifts the water into a cast iron pipe system 12 kilometers and 700 meters in length, at a height of about 44 meters. The water of another stream, the Dragon, will also be impounded and will flow by gravity to the pumping plant at Longueville and reinforce the aqueduct of Voulzie. The total expense of all this will be eighty million francs, and the system will deliver 80 thousand cubic meters of water every 24 hours.

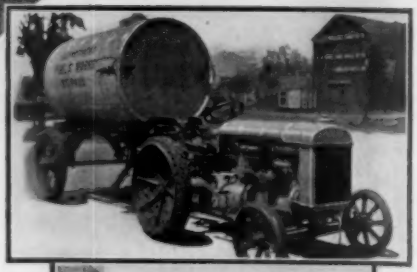
Tuberculosis and Housing in the III Arrondissement of Paris, France. 61.438.3-454.2 (44.361)

The cramped, unhealthy conditions, especially the lack of sunlight of houses, in the Third Arrondissement of Paris are held to be among the principal secondary causes of the spread of tuberculosis. This is shown very clearly by the following figures. The census of 1921 showed 99,629 inhabitants living in 2,119 houses, or 36 people to the house. Out of a total of 1,250 deaths a year in this district, tuberculosis claimed from 350 to 400. This Arrondissement, the smallest and most densely populated of Paris, has an area of about 300 acres and has remained much as it was in the time of Louis XIV. It is poorly supplied with parks, promenades or open spaces; 61 per cent of its area is built over, there being something over 300 inhabitants to the acre, while for the remainder of Paris the average is 150. It is proposed to improve the health conditions in this quarter in order to facilitate the diminution of tuberculosis. Notably it will be necessary that the Street of the Bears (la rue aux Ours), begun 20 years ago with the idea of connecting the Market district with the Bastile, be completed.

International Congress of Cities to Meet in Paris, Sept. 28-Oct. 5

As announced on page 300 of the March issue, the Third International Congress of Cities will be held in Paris, Sept. 28-Oct. 5, 1925, under the auspices of the City of Paris and the Council of the Department of the Seine.

Fordson



Gains Public Approval In City Service

Municipal pride in its public service operations is encouraged by the use of up-to-date equipment. Residents know that modern machinery brings improvements in building, sanitation, road maintenance, safety from fire hazards, etc.

Many thousands of Fordson Tractors are in daily operation in representative cities throughout the country and are creating new standards in civic service by their thoroughness, efficiency and economy.

What Fordson power is doing for other cities it will do for you. A demonstration will convince you of the savings possible through its use. Ask your nearest Authorized Ford Dealer.

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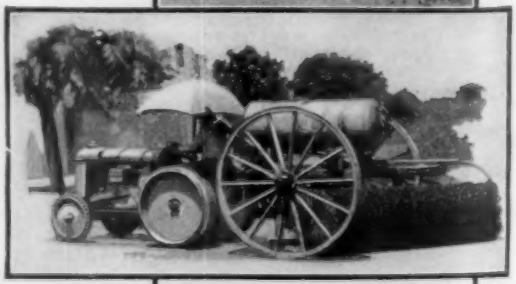

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Hints, Helps and Happenings

Mayors' Proclamations Aid Local Observances of National Music Week, May 3-9

PROCLAMATIONS recommending the celebration of National Music Week, May 3-9, are in preparation by a goodly number of mayors. For the first observance, in May of last year, the proclamations of 53 mayors found their way to the headquarters of the National Music Week Committee, 45 West 45th Street, New York City. Inasmuch as this action was taken before the movement had reached its present importance, it is expected that a great many more municipal proclamations will be issued for this year's celebration. The first to launch his official statement is Clayton C. Townes, Mayor of Cleveland, Ohio. Similar action has been taken by several state governors, the first of these proclamations being that from H. L. Whitfield, Governor of Mississippi.

In many cities the mayor is acting as the honorary chairman of the local Music Week committee. In several places the municipality has made an appropriation for the purpose. However, the celebration is generally carried on at a nominal expense.

Many chambers of commerce have taken the initiative in the organization of a citizens' committee to conduct the Music Week in their towns. Information on the subject is found in the "Guide for the Organization of Local Music Weeks," which may be obtained from the National Music Week Committee at the above address. Various civic organizations interested in municipal government and good citizenship are also the leaders in the Music Week movement in their localities. Nearly 800 cities had community-wide Music Weeks last spring and it is expected that the total will reach 1,000 in May, 1925.

The Progress of Town Planning in England and Wales

THE English Housing and Town Planning Act, 1919 (Sec. 46), made compulsory the preparation of a town planning scheme by the council of any borough or urban district containing, on first day of January, 1923, a population according to the last census of more than 20,000. The time in which the scheme must be prepared and submitted to the Ministry of Health has been extended by the Housing Act of 1923 to the 1st of January, 1929. At the same time local authorities having a population under 20,000 may also prepare a temporary scheme for their areas.

Through the cooperation of the Town Planning Department of the Ministry of Health, there has been published in the February, 1925, issue of *Garden Cities and Town Planning*, in two tables, a complete list to January 1, 1925, of local authorities in England and Wales which have passed resolutions to prepare town planning schemes. The first of these two lists contains the names of 123 municipalities where town planning is compulsory and which have passed resolutions to prepare schemes. The second list contains the names of 149 municipalities where town planning is not compulsory and which have also passed resolutions to prepare schemes.

Subsequent information from which these lists may be kept up to date is to be published in *Garden Cities and Town Planning* each quarter in future.

Exhibition of Architecture and City Planning

ENTRIES from architects and city planners in all parts of the United States and from foreign countries give assurance that the display in New York April 20 to May 3 will be the most elaborate exhibition of architecture and allied arts—including city planning—ever held. As it is evident that the eight thousand square feet of wall space which have been assigned to the city planning material in the Grand Central Palace will not accommodate half of the exhibits which are being prepared, arrangements have been made for simultaneous displays at the Pennsylvania Hotel—the headquarters of the city planning convention—and in the United Engineering Societies Building.

NOT WANTED

A Rippling Rhyme by Walt Mason

I went to Bilgetown-by-the-Lake, and cried, all filled with pep, "You folks will soon be wide awake, if you will watch my step; I'll show you all the modern curves in building up a town; I'll bring the burg, what she deserves, a national renown. Your village has the noblest site that I have ever seen, with wide savannahs left and right, and nothing cheap or mean. And yet she sleeps as she has slept since Hector was a pup; around the streets you dreamers creep, with none to wake you up. I come with salesmen in my train to jar you from your doze; to show you methods modern, sane—just watch how Bilgetown grows! I come with horns and megaphones and banners bright and gay, and I will spend a million bones to show you folks the way!" Some graybeards, when my speech was spent, remarked, "Your scheme will fail; you are the tenth promoter gent we've ridden on a rail. Old Bilgetown slumbers by the mere, remote from modern schemes, and now and then some dubs appear to wake her from her dreams. They do not seem to understand that Bilgetown cares no whoop, for solid growth, however grand, for boosters in a troop. The country needs one quiet town where drowsiness prevails, and so we take the pepful clown and ride him on a rail. Now, if you'll mount this ten-foot pole we'll bear you from our gates, and you may comfort and console the other banished skates."

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The new Best Tractors have improvements which give added strength, increased power and which further reduce the already low cost of operation.

Best owners — ever enthusiastic over the performance of these tractors, will experience even greater satisfaction when they know the new Best Tractors.

If you are interested in road building, it will pay you to see a Best Sixty or Thirty at the nearest dealer's, — or write us for his name and address.

Some of the new improvements.

Recoil springs which allow front idler to move back if any obstruction gets between track and sprocket.

Track roller bearings protected from dirt by an improved new seal.

Three speeds forward on Best Thirty with a maximum speed of 3¾ miles per hour.

Increased bearing surfaces and improved lubrication systems in Best Sixty motor.

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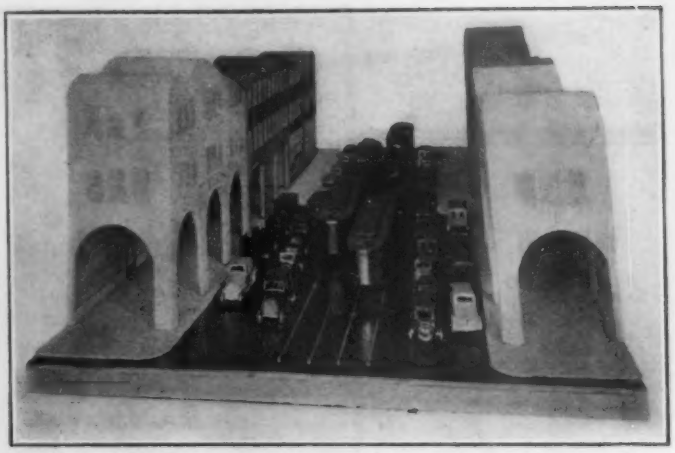
Arcade Method Suggested to Widen Pittsburgh Streets

A FEATURE of the City Planning Exhibition held during March at Carnegie Institute, Pittsburgh, was a series of models showing the relation of traffic to the width of a street. These models formed a part of the exhibit of the Citizens Committee on City Plan of Pittsburgh.

The model shown in the accompanying photograph demonstrates the way in which a four-line roadway may be widened to a six-line roadway by pushing the sidewalks under the buildings. The property owner is thus enabled to retain the upper floors of his building intact, conceding only the sidewalk space on the ground floor. By this concession he will probably gain more value from the increased traffic than he loses by giving up the space for sidewalk.



MODEL SHOWING ARCADE METHOD OF WIDENING A CITY STREET

This arcade type of building, while little used in America, is common enough in European cities. It is being advocated as a logical and attractive way to solve traffic difficulties in Pittsburgh.

After the close of the Pittsburgh exhibition, practically all the material exhibited was shipped to New York for the Architectural and Allied Arts Exhibition, which will be held there April 20 to May 3. Immediately following the New York display, the exhibits will be shown in Philadelphia.

The Pittsburgh exhibition was accompanied by a series of lectures on subjects relating to art, architecture and city planning. Among the speakers were Harvey Wiley Corbett, President of the Architectural League of New York, who spoke on "Zoning and Modern Architecture," and Andrew Wright Crawford of Philadelphia, whose topic was "American Accomplishments in City Planning."

JOHN O'CONNOR, JR.,
Business Manager,
Carnegie Institute.

(For item regarding the New York exhibition, see page 455.)

Semi-Circular Islands for Grade-Crossing Safety

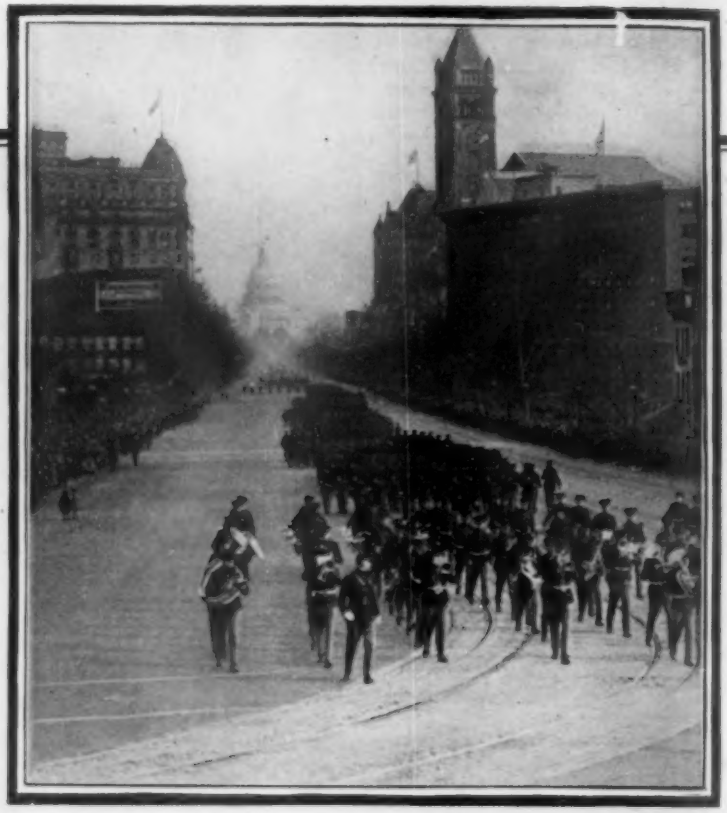
TO compel motorists to slow up before crossing railroad tracks, the device here shown has recently been developed by engineers of the Florida State Road Department and installed at a railroad crossing in Cottondale, Fla.

As will be seen from the accompanying illustration, an island in the shape of a half circle has been built in the road on either side of the tracks. One section of curb begins 70 feet from the end of the railroad ties on either side of the railroad, and is constructed along the center line of the highway to the end of the ties. Another section begins at the same point and is constructed in a portion of a circle on the right of the center of the highway, and intersects the first section of curb twenty feet from the end of the ties. The greatest distance between these curbs is ten feet and the curve is sufficient to make it necessary for motorists to slow down to get through. The Page Hi-Way guard at the outside of the road is a heavy resilient wire-link fence installed to keep the car from crashing onto the tracks in case the driver does not slow up in time to make

GRADE-CROSSSING SAFETY DEVICE RECENTLY INSTALLED AT COTTONDALE, FLA.

From Taft to Coolidge

Laid in 1907—eighteen years ago—the native-lake asphalt pavement on Pennsylvania Avenue, Washington, D. C., has carried every Inaugural Parade since the days of Roosevelt. It is still in good condition. Photograph — looking towards the Capitol—was taken March 4, 1925.



"City of Asphalted Avenues"

Pennsylvania Avenue, from 15th St. to the Capitol, is only one of the many splendid native-lake asphalt pavements in the District of Columbia that have brought Washington world-fame as the "City of Asphalted Avenues."

"Asphalted Avenues of the Capital resound with the scraping cadence of hob-nailed shoes of infantry-men," wrote one correspondent on the morning of President Coolidge's inauguration.

Millions of square yards of native-lake asphalt paving—in all parts of the world and from ten to forty years old—are proof of its extraordinary durability under the most severe conditions of weather and traffic.

Write for copy of our new book—"Around the World on Native-Lake Asphalt Pavements." It is free.

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The Native-Lake Asphalts

the bend. It has stopped cars traveling as fast as 45 miles an hour.

A sign designating the railroad crossing is placed in the parkways at the extreme ends away from the railroad as a warning during the day, and a red reflector at the same location serves as a warning at night.

A Year of Accomplishment in Cleveland

ON January 5 City Manager Hopkins submitted to the City Council of Cleveland his first annual report, covering the accomplishments of the P. R.-manager government during its first year of operation. The Cleveland *Plain Dealer* of January 6 took the occasion to present its own summary of the record, as follows:

City operated within income by $525,000.
All services expanded.
Street paving records broken and unit costs lowered.
Mall project brought near completion.
Lake front graded and eyesores removed.
Adjustment of long-standing legal tangles with railroads over lake-front property under way.
Parks rehabilitated.
Old city fire and police stations in terminals site sold for $1,700,000 and new headquarters under way.
Police force motorized, armed with new weapons; gambling claimed to be virtually stopped and traffic regulations put on systematic basis.
Women police organized in separate bureau.
Light plant rehabilitation begun.
Baldwin pumping-station completed; reservoir construction speeded; phenol nuisance in water eliminated.
Organization of metropolitan council and a beginning toward handling of metropolitan problems in a cooperative way.

In reprinting the foregoing list, the *Proportional Representation Review* quotes from the Cleveland *Plain Dealer* the following editorial comment: "It might be easy to symbolize the achievements of the new regime by means of the half-million dollars saved from last year's revenue, showing that the policy of living within one's income, much discussed under a previous administration, has not been forgotten. While such a saving is important, most citizens will agree that a far higher compliment is to be found in the quantity of constructive work done during the twelve months."

Winners Announced in National Fire Waste Contest for 1924

THE city of Indianapolis is grand winner in the National Fire Waste Contest for 1924, conducted by the Chamber of Commerce of the United States and the National Fire Waste Council. The award was made at a meeting of the Council held in Washington on March 27, 1925.

The contest was conducted in four classes, classification being made on a basis of population. Indianapolis is in Class 1, which contains cities of more than 100,000 persons, and thus was winner, too, in its class. In this class Springfield, Mass., was second and honors were won in the order named, by Portland, Ore., Reading, Pa., Milwaukee, and Oklahoma City.

Winners in the other classes were as follows:

Class 2—Winner, Fresno, Calif.; second, Hoboken, N. J.; honor cities, Terre Haute, Ind., St. Joseph, Mo., New Britain, Conn., Cedar Rapids, Iowa.

Class 3—Winner, Findlay, Ohio; second, Battle Creek, Mich.; honors, Great Falls, Mont., Dubuque, Iowa, Clarksburg, W. Va., Owensboro, Ky.

Class 4—Winner, Albany, Ga.; second, Billings, Mont.; honors, El Reno, Okla., Laconia, N. H., Oceanside, Calif., Duncan, Okla.

An aggregate reduction of $4,000,000 in fire losses in 1924, as compared with 1923, of 265 cities entered in the contest, was reported to the Council. These cities, with a total population of 10,000,000, showed a reduction of 10.8 per cent, though the property losses for the entire country increased. Their per capita loss in 1924 was $3.10 compared with $3.86, the average for the preceding five years.

The Municipal Bond Market

By Sanders Shanks, Jr.

Editor, *The Bond Buyer*

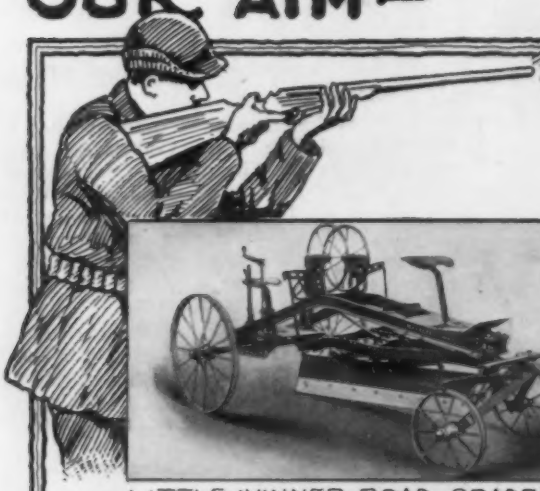
DURING the past month municipal bond prices maintained the level of the middle of February, which was equivalent to the highest point reached during the year 1924. During the month of January there were $120,000,000 bonds floated. The supply was rapidly diminished by the demand for this class of bonds by savings banks and trust companies. With the floating supply of bonds greatly depleted, and an unusually small number of municipalities in the market for funds during the month of February, there was, naturally, keen competition for the $73,000,000 of new issue sold during that month. The amount of new borrowing effected during the month of March was close to $100,000,000. One of the borrowers, the city of Chicago, succeeded in saving more than ¼ of 1 per cent in interest cost over an issue sold in January. The state of Illinois also made a saving of ¼ of 1 per cent on bonds sold over a similar period.

The largest borrower of the year was the state of Pennsylvania, which sold $20,000,000 4's during the latter part of March.

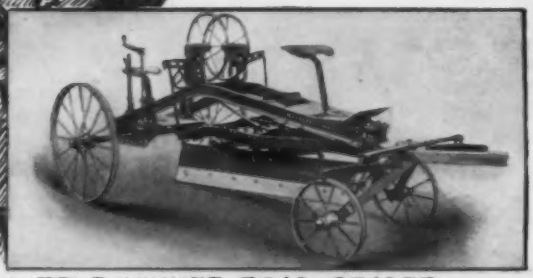
The following important issues were floated during the month of March:

Amount	Borrower	Maturity	Int. Rate (%)	Net Int. Cost (%)
$1,650,000	Illinois	1944	4	4.07
1,410,000	White Plains, N. Y.	1935-59	4¼	4.07
800,000	Oneida, N. Y.	1930-45	4 & 4¼	4.07
6,825,000	Chicago, Ill.	1927-44	4	4.10
675,000	Milwaukee, Wis.	1935-43	4½	4.11
800,000	Greene Co., Pa.	1929-36/30	4¼	4.12
524,500	Jackson, Mich.	1926-55	4¼	4.17
850,000	Fort Wayne, Ind., Sch. Dist.	1926-45	4½	4.21
900,000	Alabama	1934-69	4¼	4.22
4,800,000	Cleveland, Ohio, Sch. Dist.	1926-45	4¼	4.23
2,670,000	Milwaukee Co., Wis.	1936-45	4½	4.23
1,500,000	Toledo, Ohio, Sch. Dist.	1926-50	4½	4.24
1,230,000	Seattle, Wash.	1927-55	4½	4.32
1,000,000	Iredell Co., N. C.	1929-50	4¼	4.64

OUR AIM—



TO KEEP THE CONFIDENCE OF ROAD BUILDERS



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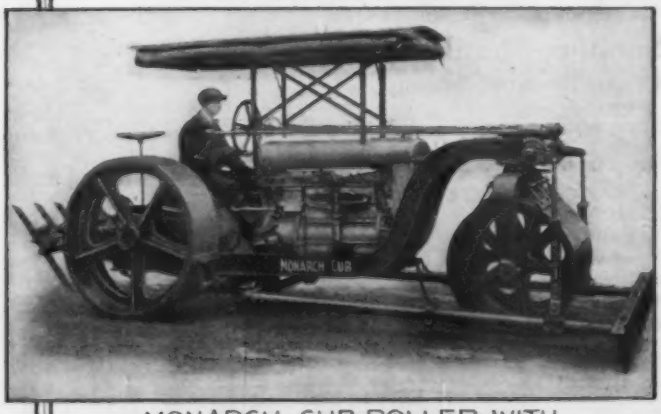
BLADE 6 FT. LONG · WEIGHT 1590 LBS · WE FURNISH 6 DIFFERENT SIZED WINNER GRADERS

CHAMPION STEEL ROCK CRUSHER MOUNTED WITH ELEVATOR SCREEN AND PORTABLE STONE BIN



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Another Conference on Irresponsible Contractors

Important Meeting in Washington Recommends Uniform Questionnaire on Finances and Experience of Public Works Contractors

FOR several years state highway officials and contractors have been cooperating toward the legitimate limitation of irresponsibility and inexperience in the highway construction field. They realize that these faults add to construction costs, that delays in completion of contracts, due to such faults, deprive communities of the economic use of the improved highways, resulting in losses which invariably exceed the difference between the low and the high bids. The study of the problem has proved that the tremendous increase in irresponsibility and inexperience with which public officials have to contend is due partly to carelessness on the part of bonding companies in writing bonds for irresponsible and inexperienced contractors.

On June 7, 1924, a conference was held in Washington, D. C., of committees representing the American Association of State Highway Officials, The Casualty and Surety Association of America, the manufacturers of equipment and materials, and the Associated General Contractors of America. The conference resulted in the appointment of three committees, to which were assigned nine important subjects bearing upon the present question of irresponsibility and inexperience as influenced by the present practice of bond writing. Reports from the three committees, made at a meeting on September 20, after careful consideration, were referred to the Surety Association of America and considered by them in a meeting in New York City during the second week of December.

Failure on the part of the Surety Association to report favorable action upon the recommendations for certain reforms in bond writing discouraged those who had participated in the former conferences, and especially as such reforms were acknowledged to be necessary. The report of one of the committees at the September conference said in part: "Conditions are not satisfactory. Practically every contractor, whatever his financial standing, whatever his experience or lack of experience, whatever his equipment, sufficient or insufficient, whatever the relation of his liquid assets to the amount of work he has on hand, whatever the extent to which he has become over-extended, can obtain a bond. Some surety company will execute a bond for him." The chairman of the committee making the report is the president of one of the large bonding companies executing bonds for highway and general construction.

In view of the bonding companies' failure to act in the matter of reform, it was decided to call a conference of all interests, participating in, or affiliated with, all branches of the construction industry, excepting the bonding companies and their interests. On February 16, 1925, this conference was held in Washington, D. C., and consisted of representatives from the American Association of State Highway Officials, the Bureau of Public Roads, the Associated General Contractors, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Society of Consulting Engineers, the American Society for Municipal Improvements, the American Institute of Architects, and manufacturers of machinery and materials. Representatives from the Construction Division of the United States Treasury, War, Reclamation and Lighthouse Departments were also present and participated in the deliberations of the conference.

The adoption of the resolutions given below followed the serious consideration of the various subjects as they relate to both public and private construction throughout the United States, which now totals six billion dollars annually, of which one billion represents highway construction and maintenance. To assist those responsible for the letting of public and private construction contracts, the conference recommended the preparation of standard forms to be used in establishing the responsibility and experience of the bidder. The conference feels that uniformity in establishing the necessary information will also discourage the floating of irresponsible and inexperienced contractors from one locality to the other. The experience of the Illinois State Highway Department with its questionnaire has shown the value of this precaution. Ohio recently adopted practically the same questionnaire, and only recently the executive committees of the Kansas and Missouri con-

24 hours per day
for 180 days

ISBELL-PORTER COMPANY
NEWARK, N. J.
CONSTRUCTION DEPARTMENT

Gardenville, N Y

July 2, 1924

Mr T A Murray,
The Wheeler-Murray Co
550-557 Ellicott Street,
Buffalo, N Y

Dear Murray:

The Novo diaphragm pump shown in the attached photograph, gave us six months of continuous twenty-four hour service, without delays except for diaphragm changes

After installing new piston rings it ran two more months, continuously, and is now (two months later) giving intermittent service as required

The other five Novo pumps purchased since are performing to our entire satisfaction.

Our insistence on Novo Power for the four cylinder single drum hoist and the Ransome two cylinder quarter yard and four cylinder half yard mixers since purchased from your company, was based upon the excellent performance of the Novo engines on these pumps. The good work done by the hoist and mixers since, has justified our choice of power.

The repair and maintenance service by your company has been prompt and efficient.

Yours very truly
ISBELL-PORTER Company
By J. W. Benner
Superintendent

THIS Novo Single Diaphragm Pump ran 4320 consecutive hours — six months, 24 hours per day—without delays except to renew diaphragms.

After putting in new piston rings (cost a little over a dollar) Novo pump ran two months more 24 hours a day— continuously.

Performance, such as this, is leading many municipalities and cities to adopt Novo Power as standard equipment. You should have this sort of reliability in *your* city work. Novo builds single and double open diaphragm pumps and single and double closed top force diaphragm pumps, all suitable for city use, such as pumping out manholes, conduits, sewers, excavations, ditches, etc.

Outfits skid or truck mounted. Can be furnished mounted on pneumatic trailer or cushion tired truck.

All diaphragm pumping outfits powered with the reliable Novo single cylinder frost-proof gasoline engine.

Novo service is world-wide. Spare parts can be obtained for any Novo Engine or Outfit, no matter how old it may be. Sixty-five distributors throughout the United States carry the Novo line and give service. Your request for information will be attended to promptly.

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tractors' associations and the highway departments of those states have given serious consideration to similar questionnaires. For the preparation of standard forms, the conference appointed a committee with S. M. Williams, Autocar Company, Ardmore, Pa., as Chairman; W. H. Connell, Deputy Secretary of Highways of Pennsylvania, L. A. Boulay, Director of Department of Highways and Public Works of Ohio, I. P. Jones, Secretary, State Highway Department, Dover, Del., J. S. Langthorn, New York, N. Y., representing the American Society of Civil Engineers, M. S. Knowles, Pittsburgh, Pa., representing the American Society of Consulting Engineers, Keith Compton, Richmond, Va., representing the American Society for Municipal Improvements, C. A. Bissell, representing the U. S. Governmental Departments, and F. J. Cranford, Brooklyn, N. Y., representing the Associated General Contractors.

RESOLUTION

Whereas: As a result of an investigation into the practice of the surety bonding of construction contracts conducted by the Joint Conference on Surety Bonds made up of representatives of the Surety Companies, the Surety Agents, Highway Engineers, and General Contractors, it is evident that the conditions in this contract surety bonding are subversive of the best interest of the public, which ultimately pays for all construction; and

Whereas: Under this system of bonding, there are defaults of contracts aggregating each year many millions of dollars and causing delays in completion of contracts, which directly result in further loss due to loss of use of improvements by the public; and

Whereas: There has been a failure to work out a sound system of investigation whereby responsibility of contractors may be determined and the defaults thereby minimized; and

Whereas: There has been connivance between agents receiving commissions incommensurate with any necessary service and dishonest and irresponsible bidders in deceiving the bonding companies with respect to the bidder's qualifications; and

Whereas: The size of the commissions received by agents is believed to have been a source of rebating, thereby inducing bidders to place their bonds with particular agents; and

Whereas: There now exists in numerous states legislation permitting a complete monopoly to corporate surety bonds to the exclusion of other methods of suretyship; and

Whereas: The annual expenditure in construction in the United States is approximately six billion dollars, and the interests of the general public demand the greatest efficiency consistent with economy in this expenditure; and

Whereas: The losses to the public, due to irresponsibility and inexperience among those undertaking the execution of construction contracts, have grown to enormous proportions when considered with other lines of business; and

Whereas: Careful study and investigation demonstrate that irresponsibility and inexperience have been greatly encouraged and increased by the careless methods in contract bond writing, and three years of effort has failed to secure any definite reform in such practices;

Therefore, this Conference, including representative committees from the American Association of State Highway Officials, the American Society of Civil Engineers, the American Society of Consulting Engineers, the American Institute of Architects, the Associated General Contractors of America, the American Society of Mechanical Engineers, the American Society for Municipal Improvements, government officials, and the Highway Industries Exhibitors' Association (embracing practically all of the manufacturers of construction equipment as well as certain material producers), recommends;

First, a legislative investigation as to the present methods of contract bond underwriting and the justification for the existing scale of premiums;

Second, the introduction of legislation in the various states prohibiting the use of certified checks furnished or guaranteed by an underwriter or its agent and providing a penalty therefor; providing the substitution of certified checks for bid bonds at all public works bidding, and also providing for the acceptance of bankable securities as well as corporate surety;

That all private owners adopt the use of bankable security in competition with corporate surety;

Third, that both public and private owners adopt a comprehensive uniform questionnaire, covering skill, integrity and responsibility, that will be submitted by all contractors bidding upon construction work;

Fourth, abolishment of unlimited authority to agents of corporate surety companies to bind their companies for unlimited amounts;

Fifth, that many of the evils now experienced would be remedied by a change in the methods of compensating agents to some other basis which takes into consideration successful completion of the contract rather than the mere process of underwriting;

Sixth, that all corporate surety companies enter into an agreement to place the collection of information, verification of experience, character and performance records, financial statements and all other essential information in the hands of some agency, which does not participate in premiums, and refuse any reinsurance to any bonding company refusing to cooperate in such a procedure;

Seventh, enactment of legislation in every state and by the general government, providing that it shall be unlawful for any government, state, municipality, or county official or employee to receive directly or indirectly payment from a surety company for services rendered or to attempt to influence the placing of a bond through a particular underwriter, and providing a fine of $500 and six months' imprisonment;

Eighth, introduction of a clause into every corporate surety bond providing for arbitration of disputes between owners and underwriters;

Ninth, that both public and private owners are urged to require surety companies to submit a standard questionnaire on their integrity as corporate sureties, approved by this Conference, as a condition precedent to the acceptance of any bond;

Tenth, elimination of all so-called "free service" by underwriters to bidders prior to the filing of a bond;

Eleventh, resolved that this Conference is of the opinion that the surety companies can correct the improper practices admitted to exist and that the members of this Conference urge that measures be immediately put into practice which will correct these abuses.

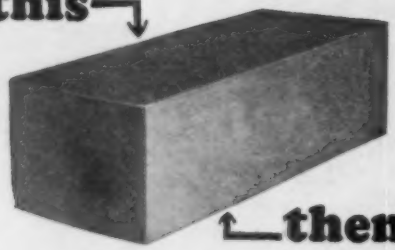
A Complete Modern Leisure-Time Program

is one which caters to all the people of the community, touches all their fundamental expressional needs, physical, intellectual, emotional, cultural, and involves in its execution the home, the church, the school, special agencies, fraternal, social, and civic bodies and the municipality itself. It must be based upon a careful and comprehensive study of the community's conditions, social, industrial, racial, and should not only serve the present, but, in true statesmanlike fashion, should be a guide to the future.

(From the Annual Report of the Playground and Recreation Association of America for the year 1924.)

Two-Sided Value

Use this



then this

DOZENS of communities have made a delightful discovery in the past few years. They have discovered that brick laid in pavements a generation ago *is actually worth more today than when laid.*

One after another has faced the need of taking up a pavement battered and roughened by 25 to 35 years of increasing traffic, only to discover that the brick when lifted out is not only in perfect shape for re-laying but, if offered for sale, could be sold for even more than its original cost!

A few of the communities that have made this profitable discovery are Pensacola, Jacksonville and Duval County, Fla., Vicksburg and Meridian, Miss., Lancaster and Bucyrus, Ohio, Lynchburg, Va., Wheeling, W. Va., Sewickley and Butler, Pa., and Omaha, Nebr.—and there are scores more who will profit by the same fact in the next few years.

VITRIFIED **Brick** **PAVEMENTS**

Pave for the future—pave for long life and low upkeep—pave for high salvage value—pave to outlast the bonds—pave with vitrified brick.

OUTLAST THE BONDS

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION, ENGINEERS BLDG., CLEVELAND, OHIO

Advocate Brick—
the pavement that outlasts the bonds.

Zoning Notes

Prepared by Frank B. Williams
Author of "The Law of City Planning and Zoning"
From data collected by the Zoning Committee of New York (233 Broadway)
Mr. Williams may be addressed in care of THE AMERICAN CITY, 443 Fourth Avenue, New York

Recent Zoning Ordinances

BALTIMORE, MD.—Ordinance, February 9, 1925.
FREEPORT, N. Y.—Ordinance, October 24, 1924.
ITHACA, N. Y.—Ordinance, February, 1925.
ROME, N. Y.—Ordinance, December, 1924.
SARATOGA SPRINGS, N. Y., Ordinance, December 8, 1924.

The Baltimore Situation

The zoning situation in Baltimore continues to supply developments of interest.

The reader of our March "Notes" will remember that the Court of Appeals, in the case of Goldman v. Crowther, dealt zoning in Maryland a severe blow. In an attempt to protect zoning as it exists in Baltimore, the city has passed the ordinance noted above. It provides that no building designed for any purpose which because of its location would create hazards from fire or disease, or would menace the public welfare, security, health, or morals shall be erected in the city, nor shall the use of any building be changed so as to bring about such a result. In each case the Zoning Commissioner is made the judge whether the building would be such a menace, with an appeal to the Zoning Board of Appeals. Upon the passage of the ordinance the Board of Appeals adopted the old zoning ordinance and maps in their entirety as regulations for its guidance in passing upon applications for permits under the new ordinance, which is adopted in addition to, and not in substitution for, the former ordinance.

Recent Zoning Decisions

CALIFORNIA.—*Miller v. Board of Public Works of City of Los Angeles, Supreme Court. Zahn and Ross v. Board of Public Works of Los Angeles, Supreme Court.* The newspapers announce the victory of the city in these two cases, in decisions sustaining the Los Angeles zoning ordinance, and reversing adverse opinions below.

The decision below in the Miller case was given in our "Notes" for February, March, and May, 1924. The reader will remember that the lower court decided that the provisions of the ordinance excluding a four-family house from the district in question were invalid.

The decision in the lower court in the Zahn case, summarized in our "Notes" for July, 1924, was to the effect that it was unreasonable to exclude a store from a given residential district.

The upper court seems, from the newspaper account, to uphold not only the general residential but also the single-family residential district and the principle of zoning in all its important respects in California. These cases will receive further notice when the text of the decisions is available.

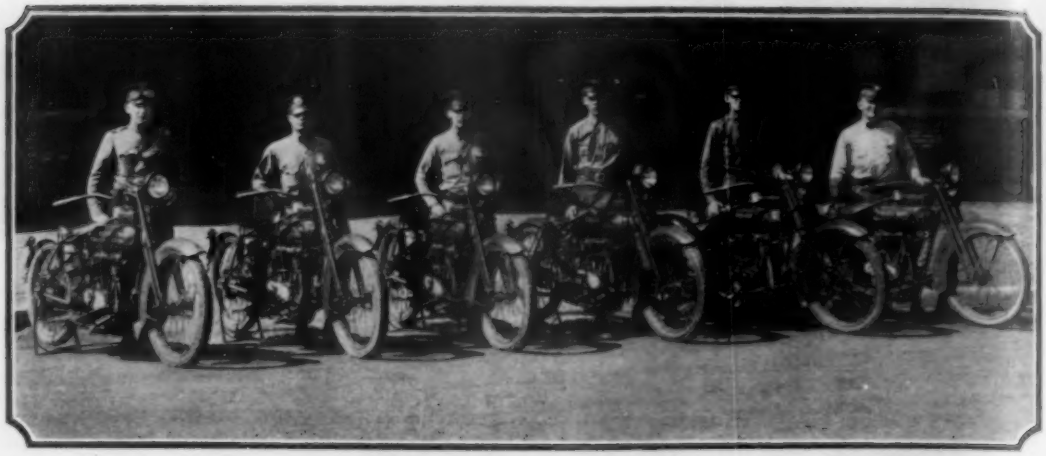
ILLINOIS.—*City of Aurora v. Burns, Supreme Court.* Injunction to restrain defendant from erecting a grocery store in a residential district contrary to the provisions of the zoning ordinance. There are several grocery stores in the district, erected before the ordinance went into effect, the use of which for this purpose the ordinance allows to continue as non-conforming structures. *Held*, that the ordinance in so far as it prevents the erection of the store was invalid. The Court does not hold that zoning is unconstitutional in Illinois, but that the provision by which the new store is forbidden, while existing store buildings are still allowed to be used for business purposes, is contrary to section 22 of Article 4 of the Illinois Constitution of 1870, which provides that the General Assembly shall not pass local or special laws granting any special or exclusive privilege, immunity or franchise whatever. The zoning ordinance arbitrarily discriminates between the existing stores and future stores, in effect giving them an unjust advantage.

The Court intimates that the difficulties caused by its decision may be obviated by the creation of districts which "would not be as large or uniform as might be desired in many instances." It is seldom that in developed parts of cities districts of a given character are entirely without buildings designed or utilized for an alien use; and, while it may be possible theoretically to design districts under these circumstances, will the results be such as to commend themselves to our common sense? Nor does the decision, if the principles it enunciates are followed, affect only what is generally known as zoning. How will it be possible practically in Illinois in future to create or extend fire limits without granting to the owner of existing (shall we say "non-conforming?") non-fireproof structures a "special or exclusive privilege, immunity or franchise," enabling him to use or rent his cheaper building at a greater profit than his competitor building later? Is it even certain that existing fire districts, in many cases, are validly created? These and many other questions seem to be raised by the wording of the Illinois constitution, which is different in important respects from that of most of the other states.

NEW YORK.—*People ex rel. Smith v. Walsh*, 211 *App. Div.* 205. The failure of the Board of Appeals to make a specific finding that there existed practical difficulties or unnecessary hardships in a given case will not defeat its permit where the evidence shows that such difficulties or hardships did exist in that the property could not profitably be used for residence purposes or stores.

The failure of the intervenor to obtain local consents did not deprive the Board of its right to grant the permit on the ground of practical difficulties or unnecessary hardships, and it was not necessary for the intervenor to attempt to secure the consents, since it appears that it would have been impossible for him to do so.

It is unnecessary to determine whether another



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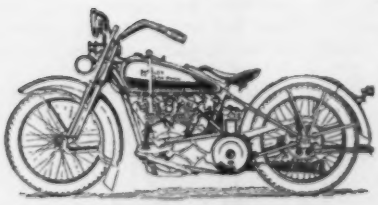
See the Harley-Davidson dealer for a demonstration.



Harley-Davidson
The Motorcycle

large garage is needed in the locality in question.

WISCONSIN.—*Friedman v. Albers, Chief of Inspection Department of City of Kenosha, Circuit Court. Held,* on rehearing, reversing the previous holding, that given changes in a non-conforming building in a residential district, not being essential to or incidental to the non-conforming use of the building as it existed, were contrary to the zoning ordinance, and that no permit for them should be issued. The plaintiff had previously been fined for violation of the building and the zoning ordinance of the city.

Recent Zoning Literature

The Iowa Town Planning Association and The Engineering Department of Iowa State College at Ames, Iowa, have issued a twenty-page pamphlet entitled "Zoning Procedure for Iowa Municipalities." The pamphlet is Bulletin No. 65 of the Engineering Extension Department of the College.

The Board of Zoning Appeals of Akron, Ohio, has just published under date of January 27, 1925, an annual report covering the working of the Akron ordinance since its adoption September 15, 1922.

The Department of Commerce, under date of March 12, 1925, has issued a mimeographed bulletin of two pages giving the history and statistics of zoning in this country, in brief, to date. It has also prepared a revised list of zoning empowering acts and zoned cities in this country, complete to the present time. Both these bulletins will be sent on request to the Department at Washington.

The City's Legal Rights and Duties

Conducted by A. L. H. Street, Attorney at Law

Municipal Control Over Space Between Curb and Property Lines

THE Mayor of a western city raises questions as to the general rights of abutting property owners in the space between the front lines of their property and the curb lines. Specifically, it is asked what power the city has to order removal or trimming of trees which have been planted along these spaces before enactment of any ordinance regulating their planting.

For the purposes of this discussion, it is assumed that in a given situation there is no charter provision or statute specifically enlarging the rights of abutters or the powers of the municipality; that it is the common case of a street dedicated to public use, from property line to property line, that the curb line exists by virtue of an ordinance fixing it, and that the particular city's legal authority consists in general control over streets.

Primarily, control over streets rests with the State Legislature. The Oregon Supreme Court does not appear to have departed from the views of judges in other jurisdictions in saying, in the case of Parker vs. Silverton, 220 Pacific Reporter, 139:

"The public streets within the limits of an incorporated city or town are a part of the public highways of the state and belong to the whole people of the state. They are maintained primarily for the benefit of the people at large. Persons residing in the city or town have an equal, but not a superior, right to the use of the streets over those who reside elsewhere. All alike must make a reasonable use of them so as not unduly or unreasonably to interfere with the common right possessed equally by all. The municipalities themselves possess no legislative power over the public streets within their corporate limits unless conferred by some legislative authority. It is within the legislative power to delegate to municipalities the sole power to regulate and control the streets within their corporate limits and to withdraw this delegated power at will."

Obstructions on Sidewalks

That an abutting property owner has no right to use sidewalk or parkway space for such purposes as storing things has been frequently declared. For example, in the case of Long vs. American Railway Express Company, 90 Southern Reporter, 1493, it appeared that defendant had left a portable scale either on a 10-foot sidewalk or a 4-foot grass plot between the sidewalk and curb. Plaintiff's son was injured through colliding with it at night. Holding that the defendant was liable, whether the scale was on the sidewalk or the parkway, the Louisiana Supreme Court said:

"Sidewalks are provided for the use of pedestrians, and not for the storing of scales; the leaving of a scale upon them, with which pedestrians may collide in the dark, necessarily constitutes negligence, especially when the leaving of obstructions upon the sidewalk is expressly prohibited by town ordinance."

The Tampa Rock Company *and its* International Motor Truck *story*

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The truck runs a 60-mile daily average. Every day finds its wheels deep in sand or mud, in what is described as "the worst going on earth." Each day puts this truck to the severest tests, but it has never been driven into places that have proved beyond its power, loaded or empty.

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Moving Goods from Vehicles

In one of the latest decisions bearing on this general subject—Cawthon vs. Town of De Funiak Springs, 102 Southern Reporter, 250—plaintiff sued to restrain defendant city from so improving the surface of an abutting street as to leave a space of about four feet between the sidewalk and the curb. It was a business street and plaintiff complained that the change would make it more inconvenient and expensive to move goods from vehicles in the street to his store than if the street were left so that vehicles could drive to the edge of the sidewalk. Dismissing the suit, the Florida Supreme Court said:

"While a municipality may be enjoined from unreasonably exercising any lawful power conferred upon it by the Legislature—for a power granted to a municipality by the Legislature cannot lawfully be so exercised as to violate organic rights of individuals—yet in this case no abuse of power by the municipality is made to appear. The rights of the complainant do not appear to be unduly invaded by an arbitrary or unreasonable change in the grade of the street so as to injure complainant's abutting property beyond the reasonably necessary requirements of the public in the use of the street, and a contemplated or resultant negligent or arbitrary trespass or injury to the complainant's premises cannot be assumed on this record."

Sheds and Awnings

Not long ago, the West Virginia Supreme Court of Appeals ruled in the case of City of Martinsburg vs. Miles, 121 Southeastern Reporter, 285, that an abutter has no right to construct a shed or awning over a public sidewalk unless authorized by valid enactment. Such a structure was declared to be a public nuisance, "whether it materially interferes with public travel or not." Holding that the city could not confer authority to maintain such structures, the Court declared that there was no charter or statutory authority conferred on the council to "grant to a private person the right to permanently occupy any portion of the public street." And the same opinion refers to numerous court decisions to the effect that "Even where a city is given exclusive power over its streets, such power must be exercised for the good of the general public, and a city cannot authorize obstructions in its streets for merely private purposes."

But the New York Court of Appeals said in the case of City of New York vs. Rice, 91 Northeastern Reporter, 283:

"So, too, with respect to street awnings, which have been held to be within the power of the city authorities to authorize, the Legislature has classified them with signs, horse troughs, telegraph posts and such like purposes, as legitimate street uses. . . . They are, within common-law rules, encroachments and obstructions; but the most that could be said is that, if the Legislature has stretched its power in delegating to the governing body of the municipality the right to authorize the erection of awnings, such an encroachment is of too unsubstantial a nature to be seriously considered as a public nuisance."

Gasoline Supply Pumps

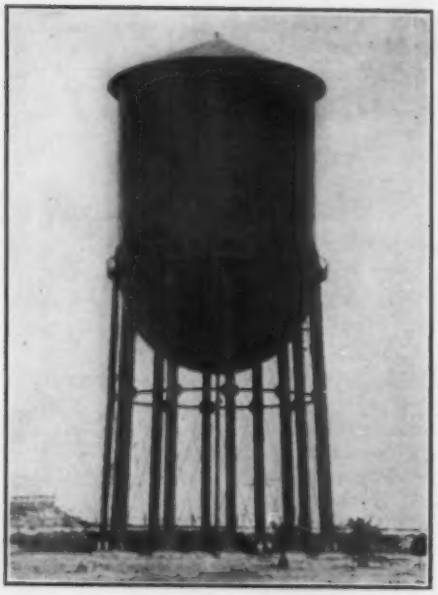
In the case of Kahabka vs. Schwab, 199 New York Supplement, 551, the Appellate Division of the New York Supreme Court, in granting mandamus against Buffalo officials to compel removal of gasoline supply pumps from curb lines, said:

"The gasoline tanks, while no doubt useful to many persons using the public streets, constitute a non-essential and private use—a use for gain of the owner of the stand, and not a use in a public or even quasi-public capacity. Neither in the provisions of the charter nor any other statute to which our attention has been called have we found authority to authorize the city to divert the public streets to such public use."

As to control over trees standing between the private property lines bounding a street, the general rule is that where the title to the soil of the street is in the abutting owners, subject to the public easement for purposes of travel, such owners may remove the trees and are liable for damages resulting from their existence. On the other hand, where the city owns the fee, it owns the trees. (28 Cyc. 848.) But, ordinarily, "The municipality has control over trees in the street, which is not divested by a license to abutters to set out and care for shade trees . . . And abutters are not bound to care for trees planted on the sidewalk by the municipality, in the absence of any statute or municipal regulation imposing that duty upon them. Injuries to trees may be prohibited by the municipality, but power to regulate the planting and protection of shade trees does not include the power to compel an abutter to cut down and remove them." (28 Cyc. 851.)

Trees

Excepting as the municipal power is restricted by charter, statutory or other limitation, it seems that trees standing in streets may be removed or trimmed as the municipal authorities reasonably may deem proper and necessary in fitting the streets for use for public travel, maintenance of telephone lines, etc. After an extended review of court decisions from many of the states, the Oklahoma Supreme Court probably laid down as fair and generally recognized rules as can be stated



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when it said in the case of Norman Milling & Grain Company vs. Bethurem, 139 Pacific Reporter, 83:

"Subject to the requirement that it must act in good faith, and not abuse its exercise of power, a city has the power of control over its streets, including the parkings and all spaces occupied by both the trees and wires thereon; and this power is paramount to any right that either the grower of trees or the owner of wires may acquire thereon."

Apparently, the power of a city to authorize the removal or trimming of trees standing within street limits depends mainly upon the exercise of good faith and reason, rather than upon the circumstance whether or not abutters were permitted to plant the trees by reason of an ordinance specifically authorizing it, or by reason of absence of any ordinance forbidding such planting.

Items of Municipal Law

Walks Connecting Main Sidewalks with Street Crossings Held To Be Crosswalks

In the recent case of Mann vs. City of Onawa, 200 Northwestern Reporter, 306, the Iowa Supreme Court decided that sidewalks extending from main sidewalks to curb lines to connect with street crossings, are properly to be classified as "crosswalks" and that the cost of constructing them cannot be assessed against private property under the Iowa Code.

Revesting Title to Land Dedicated as a Park

Two blocks of ground shown on the plat of an addition to a city were designated as "Park." They were wholly unsuited to use for residences, and were intended by the dedicator to be improved by the city for public purposes. Under the circumstances it was held by the Oklahoma Supreme Court in the case of City of Tulsa vs. Aaronson, 229 Pacific Reporter, 596, that the city's acceptance of the dedication would have carried with it an implied agreement to improve the tract and render it suitable for park purposes. But it was further decided that where the city determined not to so improve the ground, because of lack of funds, and expressly disclaimed its acceptance, that amounted to such non-use and abandonment as justified legal proceedings to vacate the dedication.

Power to Issue City Bonds for Municipal Golf Courses Must Be Plainly Conferred

In view of the rule that the authority of municipalities to levy a tax must be made to clearly appear, and that doubts, if any, as to the power must be resolved against the municipality, it is not evident that the power to issue bonds to acquire land for an enlarged golf course in a city is included in charter and general statutory powers to purchase property for public parks and playgrounds and for any other municipal purpose the city council may deem proper, and to issue bonds for any purpose stated, or for any municipal purpose authorized by the charter or general law; the issuing of bonds to construct a golf course being more in the nature of a corporate than of a governmental function. But the legislature might authorize municipalities, within appropriate limitations for the protection of taxpayers, to purchase and maintain golf courses to be impartially conducted in the interest of the local public, thereby declaring it to be a municipal purpose. (Florida Supreme Court, City of Bradentown vs. State, 102 Southern Reporter, 556.)

Scope of Municipal Right to Levy Special Improvement Assessments

Outlining the ground on which local assessments may be levied for municipal improvements, the United States Circuit Court of Appeals, Eighth Circuit, said in the recent case of Fidelity National Bank & Trust Company vs. Swope, 2 Federal Reporter (2d Series), 676:

"It is well settled that the cost of local improvements such as street grading and paving, curbing and guttering, and laying of sidewalks may be assessed against the abutting property running back a reasonable distance and apportioned upon the frontage, the area, the value of, or the estimated benefit to, the several parcels. . . .

"While such improvements are for public use, the assessment of the cost thereof against the abutting property is not inequitable. In the course of time through continued improvement all abutting property and each owner of abutting property in the community make similar, if not exactly the same proportional, contributions for the public good. Under these conditions the increase in the value of the abutting property and the convenience resulting to the several owners are generally, and as far as humanly practicable, the same. The underlying principle is that the special benefits accruing to the abutting property from the improvements justify the assessments. . . .

"On the other hand, there is no principle of law or equity which justifies the assessment of property abutting on one street to pay for local improvements on some other street. . . .

"Over against strictly local public improvements, the cost of which may be assessed against the adjacent property specially benefited thereby, there are public improvements of such general character that the cost of making them may not be legally assessed upon anything less than all the property of the municipality, as for instance, city halls, court-houses, and the like.

"Between these there is a class of public improvements the cost of which, while not confined to adjacent or abutting property, may be assessed upon something less than the whole of the municipality because specially benefited; parking districts, districts to pay for the construction of bridges, viaducts, and the like, belong to this class. For lack of a better name this class may be designated as semi-public improvements."

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Proceedings of the American Society for Testing Materials, Twenty-Seventh Annual Meeting:—Part I, Committee Reports, New and Revised Tentative Standards, Lists of Standards and Tentative Standards, 1,173 pp.; Part II, Technical papers, 1,133 pp. American Society for Testing Materials, Engineers Club Building, 1315 Spruce Street, Philadelphia, Pa. Each Part, $6 in paper, $6.50 in cloth, and $8 in half leather binding.

The Proceedings of the American Society for Testing Materials are invaluable to municipal officials, as this society is the leader in the preparation of specifications and is the medium through which many other technical organizations work in formulating proper practice and tests of materials. The first volume contains the annual reports of 35 of the standing committees of the Society, together with the discussions of these reports at the annual meeting. They include reports of the committees on ferrous and non-ferrous metals, cements, ceramics, concrete, gypsum, lime, preservative coatings, petroleum products, road materials, coal and coke, waterproofing materials, electrical insulating materials, shipping containers, rubber products, textile materials, thermometers, methods of testing, and nomenclature and definitions, as well as 87 tentative standards which have either been revised or are published for the first time, the annual address of the president, and the annual report of the executive committee. It also contains three reports of the Joint Committee on Investigations of Phosphorus and Sulphur Steel, the Effect of Sulphur on Endurance Properties of Rivet Steel, Metallographic Investigations of Effect on Rivet Steel, and Effect of Sulphur on Structural Steel, and the report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. Part II contains 47 technical papers with their discussions. These include valuable information on the results of investigations by experts in the field of engineering materials. This part also includes a symposium on the effect of temperature upon the properties of metals, and a symposium on corrosion-resistant, heat-resistant and electrical-resistant alloys. These symposiums include valuable, new, and hitherto unpublished data.

Diesel and Oil Engineering Handbook.—By Julius Rosbloom. The Technical Publishing Company, Los Angeles, Calif. 1925. Third, enlarged edition. 792 pp. Price $5.

A practical book of instruction and ready reference purposes on oil engines of high compression and low compression, compressors, pumps and such equipment necessary in oil engine installation, diesel electric drives and oil field equipment.

This valuable book, which has met with such a response in the municipal field, and in the general power-plant industry, is written in practical style to assist the operator as well as others to secure information of value with the least effort. It is replete with illustrations of practical nature, tables, color inserts, blueprints, folding inserts, all helpful to the understanding of the text. It contains a general discussion of the latest types of leading diesel engines, practical instructions in operation, a chapter devoted to diesel-electric drive, another to fuels and lubricants, and an appendix devoted to the latest improved application of the diesel engine in the various fields of engineering.

Principles of City Land Values.—By Richard M. Hurd, President, Lawyers Mortgage Company. Published by The Record and Guide, New York. 1924. Fourth edition. VIII + 159 pp. Views, drawings, plans. $3.50.

The principles originally stated in the first edition of this book, for some time out of print, are still true and have not needed to be changed in this new edition. The automobile, making available large new areas for residential purposes, and the radio, bringing the world to one's door, have not altered the general principles of city growth. The book contains many maps illustrating the growth of American and European cities, photographs showing the good and bad utilization of building sites, and drawings giving the distribution of front-foot values in a number of cities.

Tax Burdens and Public Expenditures.—Published by the National Industrial Conference Board, Inc., New York. 1925. VII + 70 pp. Charts, tables. $1.50.

A presentation of facts which must be comprehended in order to advocate a wise business policy for Federal, state and local governments. It explains every citizen's taxation burden, showing how much money government is raising by taxation, how much it is borrowing, and how it is spending its revenues, also the property and income that are exempt from taxation.

Sewerage and Sewage Treatment.—By Harold E. Babbitt, Associate Professor of Municipal and Sanitary Engineering, University of Illinois. Second edition, revised. John Wiley & Sons, Inc., New York, 1925. XV + 516 pp. Illustrated. $5.00.

This second edition of a very useful text-book on sewerage and sewage treatment has been revised to keep pace with the rapid advance in the art of sewage treatment, particularly the activated sludge process and the use of Imhoff tanks. Professor Babbitt has shown an admirable desire to make this book most useful and has endeavored in his revision to meet the criticisms which were received from teachers and engineers who used the first (1922) edition. Following the introduction, the chapters take up successively work preliminary to design, quantity of sewage, hydraulics of sewers, design of sewerage systems, appurtenances, pumps and pumping-stations, materials for sewers, design of the sewer ring, excavation and backfilling, trenching and tunneling, construction of sewers, maintenance of sewers, composition and properties of sewage, disposal by dilution, screening and sedimentation, septicization, the contact bed, the trickling filter, the intermittent sand filter, activated sludge, miscellaneous process of sewage treatment, sludge, and a comparison of the processes of sewage treatment.

Sharing Management with the Workers.—By Ben M. Selekman, Department of Industrial Studies of Russell Sage Foundation. Published by the Russell Sage Foundation, New York. 1924. XIV + 142 pp. $1.50.

This is a study of the partnership plan of the Dutchess Bleachery at Wappingers Falls, N. Y., which is stated to be "one of the most advanced, most sincere, and most comprehensive schemes of industrial relations introduced into industry on the initiative of the employers." The chapter on Community Work of the Board of Operatives is of special interest to the readers of **The American City,** showing improvements made in housing, sanitary conditions and recreational facilities.

Transactions of the International Conference on Sanitary Engineering, London, 1924.—Published by the Institution of Sanitary Engineers, London, 1925. Apply to the American Public Health Association, 370 Seventh Avenue, New York, N. Y. VIII + 383 pp. $4.00.

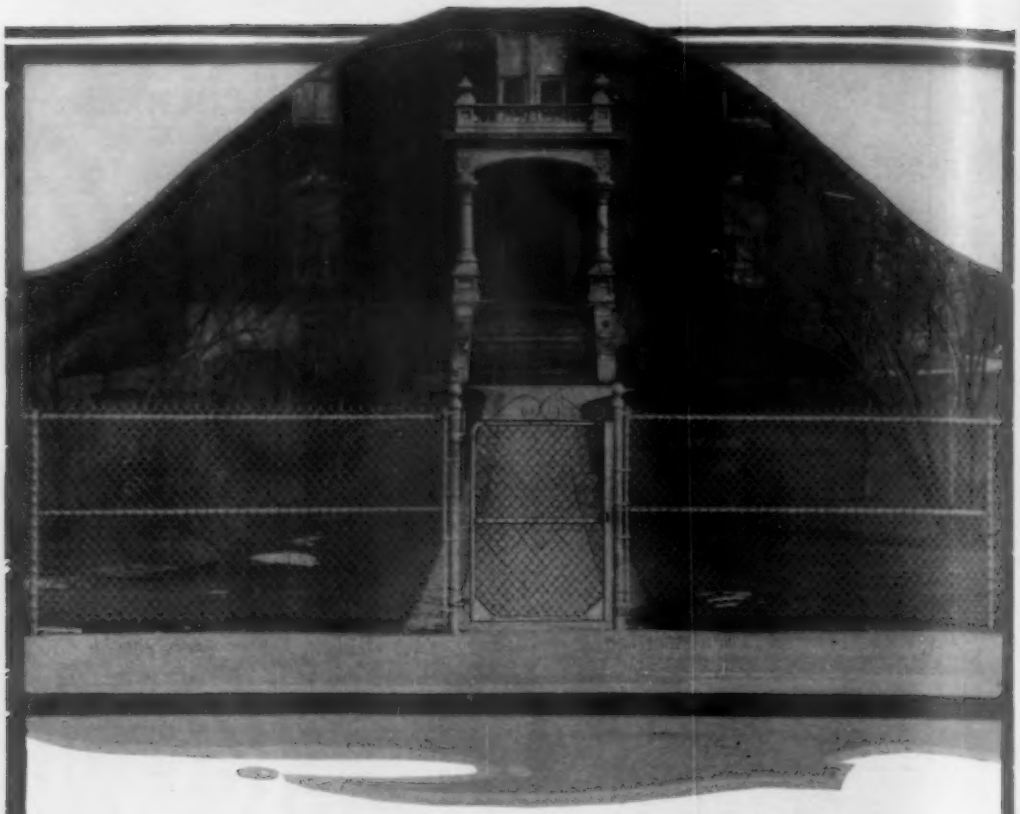
This most interesting book for sanitary engineers and health officers is being sold in the United States by the American Public Health Association at cost. The principal subjects dealt with cover state sanitary administration, works for the prevention of malaria and yellow fever, methods of disposal of sewage and trade wastes in various countries, treatment of sludge arising from the agitation processes of sewage disposal, the fertilizing value of sewage sludge, sewerage and the control of storm water, design of sedimentation works, house sanitation, refuse collection and disposal, national control of water sources, and water purification. Those who have contributed to this book include such well-known American engineers as the late George C. Whipple, Professor of Sanitary Engineering, Harvard University; W. L. Stevenson, Chief Engineer, Pennsylvania State Department of Health; J. A. LePrince, Senior Sanitary Engineer, U. S. Public Health Service; R. E. Tarbett, Sanitary Engineer, U. S. Public Health Service; Harrison P. Eddy, Consulting Engineer, Boston, Mass.; T. Chalkley Hatton, Chief Engineer, Sewerage Commission, Milwaukee, Wis.; Langdon Pearse, Chief Engineer, Sanitary District of Chicago, Ill.; George W. Fuller, Consulting Engineer, New York City; and Samuel A. Greeley, Consulting Engineer, Chicago, Ill.

History of National Music Week.—By C. M. Tremaine, Director, National Bureau for the Advancement of Music; Secretary, National Music Week Committee. Published by the National Bureau for the Advancement of Music, 45 West 45th Street, New York, N. Y. 1925. 232 pp. Illustrated. $2.00.

The origin, meaning and growth of the Music Week idea are explained in this volume, which devotes many pages to accounts of the way in which National Music Week has been proclaimed and observed throughout the country. These details of methods and expenses are valuable to those who realize the importance of this movement and wish to further it as a means of community development.

Principles of Real Estate Appraising.—By John A. Zangerle. Published by the Stanley McMichael Publishing Organization, Cleveland, Ohio. 358 pp. $5.00.

This is a correction, as to number of pages and price, of the notice in our February issue.



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Educational Facilities in Saint Louis Outside of the Schools.—Prepared by Mrs. John Auer for the Educational Committee of the College Club. 11 pp. In the Monthly Bulletin of the St. Louis Public Library. Listing in tabular form detailed information secured directly from the agencies represented, during a survey made in preparation for the observance of American Education Week, November 18-24, 1923, and brought up to date in January, 1925. In each case the address of the agency is given, with a statement of the opportunities offered and to whom available. A final tabular summary groups the agencies under the heads of the kinds of opportunities they present—academic, vocational, music and art, libraries, health, citizenship, recreation, and organizations and clubs with educational activities. (Apply to the St. Louis Public Library, St. Louis, Mo.)

The Journal of Land and Public Utility Economics.—Volume I, Number 1, January, 1925. Published quarterly for the Institute for Research in Land Economics and Public Utilities, by A. W. Shaw Company, Cass, Huron and Erie Streets, Chicago, Ill. Richard T. Ely is Editor-in-Chief (Sterling Hall, Madison Wis.), and E. W. Morehouse Managing Editor. Among the articles in this first number are the following: Research in Land and Public Utility Economics, by Richard T. Ely; Customer Ownership of Public Utilities, by Ralph E. Heilman; Housing in the United States, by John M. Gries; The Prevention of Economic Waste by City Planning, by Harland Bartholomew; and Water-Power Situation in the United States, by Walter H. Voskuil. $5 a year; $1.25 a copy. (Apply to the publishers.)

Salary Standardization and Rates of Compensation for City Employment, St. Paul, Minn.—Pocket-size booklet of 18 pp. containing the ordinance, revised to January 24, 1925, which states the compensation rates for all city employment, positions and offices in St. Paul, except those whose compensation is fixed by charter. This is a companion measure to the civil service classification. The salary-fixing power rests exclusively with the City Council, and the adoption of this ordinance by the Council effectively unifies the functions of classification and salary standardization. The salaries are based on the cost of living and are subject to annual adjustments. (Apply to City Clerk, St. Paul, Minn.)

Report on Status of County Efficiency and Economy Program.—Typewritten report to the Board of Cook County Commissioners, Illinois, by J. L. Jacobs Company, engineers, cost accountants, and statisticians, Monadnock Building, Chicago, Ill. 6 pp. Summarizing the more important measures adopted and the estimated changes in the salary and other expenditures brought about by improvements in administrative organization and methods. (Apply to J. L. Jacobs & Company.)

New Jersey Sewage Works Association.—Proceedings of the Ninth Annual Meeting, held April 25, 1924, in Trenton, N. J. 16 quarto pp. Containing the following papers: Some Sewage Experimental Work Accomplished and Under Investigation at the Sewage Substation During 1923, by Dr. Rudolfs; Settling Tanks and Separate Sludge Digestion, by Dr. W. DeWitt Vosbury; and the Sewage Disposal Project of Philadelphia, by H. M. Beaumont. (Apply to John R. Downes, Secretary, New Jersey Sewage Works Association, Bound Brook, N. J.)

The Reorganization of the Department of Public Works, Detroit, Mich.—A memorandum prepared for the Commissioners of Public Works by the Detroit Bureau of Governmental Research, Inc., February, 1925. 16 mimeographed pp., besides charts. The present organization has been viewed by the Commissioner of Public Works and his assistants with the idea of combining like functions; organizing geographically, and reducing the number of subordinate positions that report directly to the Commissioner. (Apply to the Detroit Bureau of Governmental Research, Inc., Detroit Mich.)

Report of the Committee on Research on the Proposed Amendment to the Constitution (of New York State) Exempting Bonds Issued for Rapid Transit Purposes from the Debt Unit.—Adopted by the Executive Committee of the Advisory Committee on February 18, 1925, for recommendation to the County Committee. Published by the Political Research Bureau of the Republican County Committee of New York, 150 Nassau Street, New York, N. Y. (Apply to the Bureau.)

Toledo Fire Department.—A report on the Department, made by the Commission of Publicity and Efficiency, Toledo, and approved February 6, 1925. In The Toledo City Journal of February 28, 1925. 9 quarto pp. Presenting the results of a test of the Fire Department on the following points: increased cost and personnel; a comparison with other fire departments; striving for better standards; and future policy. Closing with ten recommendations by the Commission. (Apply to The Toledo City Journal, Toledo, Ohio.)

Highway Research Board.—Summary Bulletin of the Proceedings of the Third and Fourth Annual Meetings of the Highway Research Board of the National Research Council, Washington, D. C. 24 pp. Illustrated. This report explains the organization of the Board, and summarizes the reports of committees on the economic theory of highway improvement; structural design of roads; character and use of road materials; highway traffic analysis; highway finance; and maintenance of roads; and outlines the work that is being carried on in determining the value of reinforcement in concrete roads. Charles Upham, State Highway Engineer of North Carolina, Raleigh, N. C., is Director of the Highway Research Board. (Apply to the Board.)

Faribault's Electrical Situation.—Official publication of the city of Faribault, Minn., on the proposed municipal electric light plant project. 8 pp. A reprint from an official publication in the Faribault Daily News of January 27, 1925. Setting forth the method by which the city determined to investigate the feasibility of the proposition, and the conclusions of the consulting engineer, Arthur L. Mullergren, 555 Gates Building, Kansas City, Mo. (Apply to Thomas H. Quinn, Mayor, Faribault, Minn.)

Seventeenth Annual Meeting of the Assembly of Civil Service Commissions.—Proceedings of this meeting, held in Detroit, Mich., June 9-14, 1924. XIII+150 pp. Photographs; map showing in convenient form all the important jurisdictions in the United States and Canada operating under civil service laws. Containing important papers, addresses and discussions on various subjects in the civil service field. (Apply to the Secretary-Treasurer of the Assembly, Charles Shaughnessy, Chief Examiner, Philadelphia City Commission, Philadelphia, Pa.)

Board of State Tax Commissioners and State Board of Assessors, Michigan.—Thirteenth Report, for 1923-1924. 87 pp. The material is presented under the following heads: Assessment of Property; Reviews of Assessments; Reviews of County Equalizations; Mortgage Taxes Determined; State Equalization; Exemptions; Governmental Costs; Public Debt; Legislation Enacted, 1923; Legislation Recommended; Statistical Tables. (Apply to B. F. Burtless, Secretary, Board of State Tax Commissioners, Lansing, Mich.)

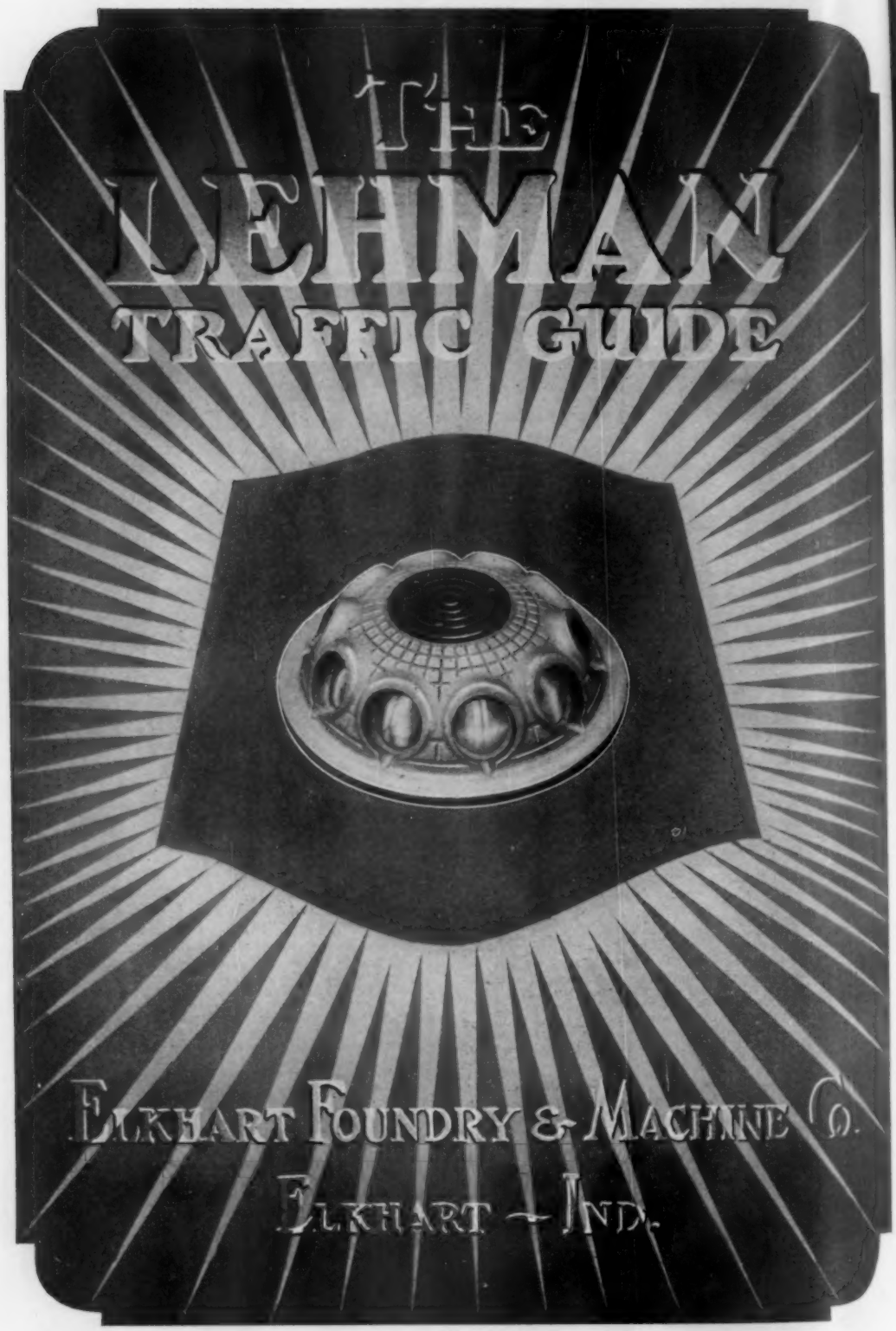
A New House of Correction, Detroit, Mich.—A report of the Mayor's Committee and a study made by the Detroit Bureau of Governmental Research. July, 1924. 55 mimeographed pp. Presenting the needs and conditions of the correctional situation in Detroit, and recommending policies and plans for the better functioning of a new House of Correction. (Apply to the Detroit Bureau of Governmental Research.)

Fire Prevention in Heating and Power Plants.—Fire Prevention Bulletin No. 15 issued by the Insurance Department of the Chamber of Commerce of the United States of America. This is one of a series which is being sponsored by various members of the National Fire Waste Council. (Apply to Chamber of Commerce of the United States, Washington, D. C.)

List of Public Utilities Municipalized Since 1917.—Compiled by Leo Kenneth Mayer, Director, and Cornelius M. Sheehan, President, American City Government League, 8 Adelphi Place, Brooklyn, N. Y. February 1, 1925. 4 mimeographed pp. (Apply to the League.)

Water Department, Baltimore, Md.—Report on the Organization of the Water Department, Submitted to the Committee on Efficiency and Economy, by the Water Board, City of Baltimore. 1924. 10 typewritten pp. The attempt is made in this report to define the status of the Water Department of the city and to show the impracticability of the inclusion of a utility of its size and specialized function in a Department of Public Works. The Committee on Efficiency and Economy was appointed by Mayor Howard W. Jackson to study the operation and control of the municipal departments, and is composed of members of various local business enterprises, who are giving their services gratis to the city in this work. (Apply to V. Bernard Siems, Water Engineer, Baltimore, Md.)

Outstanding Features and Salient Provisions of an Ordinance Providing for a Comprehensive Municipal Local Transportation System, Chicago.—Recommended to the City Council February 11, 1925, by the Committee on Local Transportation. Prepared by Francis X. Busch, Corporation Counsel, Chicago. 12 quarto pp. 3 folding maps. The proposed system embraces surface lines, elevated lines, subways, busses, and any other desirable means of local transportation. The ordinance provides for the immediate building of subways and hundreds of miles of extensions of surface and elevated lines; free interchange of transfers between all parts of the system; and future expansion and improvement. (Apply to the Municipal Reference Library, 1005 City Hall, Chicago, Ill.)



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Electric Railways, 1922.—In the Census of Electrical Industries, published by the Department of Commerce, Bureau of the Census. 1925. 256 pp. Apply to Government Printing Office, Washington, D. C. 30 cents. This census covers all street railways, including those operated by other than electric power, and all interurban railways not using steam as motive power, including electrically operated divisions of steam railroads. The period covered by the operating statistics is, with slight exceptions, the calendar year 1922. The balance sheet and equipment report relates to December 31, 1922, or the nearest last day of each company's business year. The data include those of bus lines operated by electric railroads. Sixteen municipally operated electric railways are reported. Valuable data on operation and on rates of fare are given.

The Government of Metropolitan Areas.—A study, by the Detroit Bureau of Governmental Research, of the experience of a number of other communities with respect to metropolitan districts, with the idea of shedding light on the problem of establishing one or more metropolitan districts in southeastern Michigan. Published in "Public Business," for December 20, 1924. 24 pp. Maps. A special discussion of the problems and possibilities of the Detroit area is given, and two suggested amendments to the state constitution, with proposed legislation permitting and regulating the establishment of metropolitan districts. The situation is summarized in a set of definite conclusions. (Apply to the Detroit Bureau of Governmental Research, 316 East Jefferson Avenue, Detroit, Mich.)

Ottawa Suburban Roads Commission.—Annual Report of the Engineer for the year 1924. An important report of 19 quarto multigraphed pp., including tables, and with four actual photographs of road work in process and completed. The data on costs are of particular interest. (Apply to Allan K. Hay, Secretary and Engineer to the Commission, 279 Carling Avenue, Ottawa, Ont.)

Street Tree Planting in Its Relation to City Planning.—By Wayne C. Holsworth, Landscape Forester and Manager of Harvard Tree and Shrub Service, Cambridge, Mass. Reprint from Parks & Recreation, the official publication of the American Institute of Park Executives. 32 pp. Illustrated. The purpose of this paper is to emphasize the esthetic and health values of street tree planting as it may be carried out when its relations to city planning are considered. A detailed and valuable discussion. 10 cents. (Apply to author, at address above, or to Parks & Recreation, Box 432, Rockford, Ill.)

International Association of Fire Engineers.—Proceedings of the Fifty-second Annual Convention of the Association, held at Buffalo, N. Y., August 19-22, 1924. 308 pp. Containing addresses and discussions on many phases of the subject of fire prevention and control. (Apply to the Secretary of the Association, James J. Mulcahey, Fire Chief, Yonkers, N. Y.)

Electric Light and Power as a Public Utility.—By Delos F. Wilcox. Supplement to the National Municipal Review, March, 1925. 16 pp. The heads under which this discussion of the struggle between private power and public power is elaborated are: Limitations of Water Power; Long Distance Transmission; Growth of Large Transmission Systems; Financial Amalgamation; Municipal Ownership in Minnesota; Rates; Higher Rates in Spite of Competition; Larger Minnesota Cities Have No Power of Regulation; No Regulation by State Commission; Rural Electrification; Rate Basis for Hydro-Electric Power; Comparison with Winnipeg and Ontario; How Shall Rates Be Judged? How Much Can the Farmer Pay? (Apply to National Municipal League, 261 Broadway, New York, N. Y.)

City Planning at Canton, Ohio.—Preliminary Report and Program, prepared for the City Planning Commission by Morris Knowles, Incorporated, engineers, Pittsburgh, Pa., and Cleveland, Ohio. December, 1924. 44 pp. The various parts of the program are discussed somewhat in the order of their importance, with reference not only to the needs of the city but to the orderly development of the planning studies. The Program of Suggested Activities is given in synopsis and is followed by an estimate of the cost of the total work. (Apply to the City Planning Commission, Canton, Ohio.)

Brief Bibliography on City Planning.—The Carnegie Library of Pittsburgh suggests books on city planning to be read in connection with the City Planning Exhibition in the Department of Fine Arts, Carnegie Institute, March 2-29, 1925. 8 pp. Handy size. These books present a comprehensive view of the historical development of city planning and its state at the present time. Most of them have been written by Americans for American conditions, but some of the most important and elaborate books on English and Continental practice are included. 5 cents. (Apply to Carnegie Library of Pittsburgh, Pittsburgh, Pa.)

Highway Income from the Motor Vehicle.—By Henry R. Trumbower, Economist, United States Bureau of Public Roads. 8 quarto pp. in "Public Roads," published by the United States Bureau of Public Roads, Washington, D. C. Charts, tables. A careful study of the raising of revenues from motor-vehicle users to meet highway cost. This revenue is secured mainly by licensing motor vehicles and by taxing gasoline. The tabular and graphic material gives data by states, showing interesting comparisons. (Apply to the Bureau of Public Roads.)

Interrelationships of Hospital and Community.—An essay by Edward A. Fitzpatrick, which won first prize in the Modern Hospital Publishing Company's competition which closed November 1, 1924. 12 quarto pp. In the Modern Hospital for February, 1925. The judgment of the committee of awards was guided by the ability with which the following essentials were treated: adequacy of bed capacity; minimum services; additional desirable services to meet the community's need; out-patient service; staff and staff relationships; relation of hospital to various community health and public welfare organizations; attitude of public toward hospital and how it can be influenced. (Apply to the Modern Hospital Publishing Company, 22 East Ontario Street, Chicago, Ill.)

Planning of Small Community Hospitals.—By B. Evan Parry, M. R. A. I. C., Supervising Architect. Publication No. 14 issued by the Department of Health of Canada, Ottawa, Ont. 99 pp. Photographs, plans. The material is presented under the following heads: Preliminary Survey; Selection of Sites; Planning the Hospital; Construction; Equipment; Sanitation; Plumbing; Gas Fittings; Heating; Insulation; Ventilation; Decorative Colour in the Hospital. A straightforward, understandable treatment of the subject. (Apply to the Department of Health, Ottawa, Ont.)

Milwaukee's Proposed Service-at-Cost Franchise.—By W. H. Maltbie. 4 pp. In "Aera" for February, 1925. A review of a contract which embodies mutual concessions by the municipality and the company and has a number of unique features. (Apply to "Aera," 292 Madison Avenue, New York, N. Y.)

League of Cities of the Third Class in Pennsylvania.—Proceedings of the Twenty-fifth Annual Convention, held in Sharon, Pa., September 2-4, 1924. 159 pp. Containing discussions of a number of subjects relating to municipal affairs—taxation, traffic, annexation of territory, sewage disposal, street widening, home rule, etc. (Apply to Fred H. Gates, Secretary of the League, Wilkes-Barre, Pa.)

Progress Report of the City Plan Commission, Toledo, Ohio.—Including a summary of the recommendations and conclusions contained in the following reports of the Commission; Major Streets; Transit Plan; Railroad Transportation; Zoning Ordinance; Port Survey; Industrial Survey. Aside from the recreation and civic art studies, the city plan has now been completed. It includes also three special studies—the port and industrial surveys and a survey of the proposed location of the Harding Memorial Bridge. 71 quarto pp. Views, maps, tables. Harland Bartholomew is the City Plan Engineer. (Apply to the City Plan Commission, 305 Valentine Building, Toledo, Ohio.)

The Annual Appropriation Bill of the City of Chicago for the Year 1925.—Passed January 22, 1925; amended January 30, 1925. 126 quarto pp. Published February, 1925. (Apply to Municipal Reference Library, 1005 City Hall, Chicago, Ill.)

High School Service, The American National Red Cross.—Volume I, Number 1, January, 1925. 20 pp. Illustrated. Published with the idea of rendering a service to secondary education, and of opening opportunities for boys and girls of high school age to engage in the service of humanity. This first number contains an article on the Los Angeles; "Montana's Many Curious Creatures;" "The Navajos;" "The Indian Schools Enroll;" editorials on "The March Around the World" and the presentation of the Red Cross flag to the Los Angeles; a portion of an address by President Coolidge on the American National Red Cross; reports of Red Cross activities in high schools, and letters from abroad, etc. $1.00 a year, exclusive of June, July, and August; single copies, 15 cents. (Apply to American National Red Cross, Washington, D. C.)

Municipal Reports Received

BOSTON, MASS.—Annual Report, Public Works Department, 1923

FORT WAYNE, IND.—Annual Report, Municipal Electric Light and Power Plant, 1923, also history of plant

KALISPELL, MONT.—*Annual Report*, 1924

NEWORT, R. I.—Annual Report, Highway Department, 1924

GENESEO, N. Y.—Report of Superintendent of Water-Works, 1924

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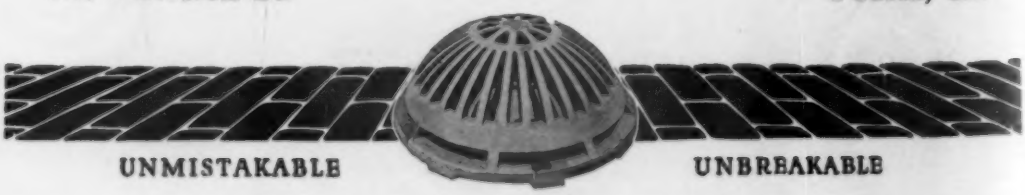

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On the Calendar of Conventions

APRIL 13.—NEW YORK, N. Y.
National Committee on Prisons and Prison Labor. Annual meeting. Executive Director, E. Stagg Whitin, 2 Rector Street, New York, N. Y.

APRIL 13-17.—ST. LOUIS, MO.
American Institute of Electrical Engineers. Spring convention. Secretary, F. L. Hutchinson, 33 West 39th Street, New York, N. Y.

APRIL 20-24.—NEW YORK, N. Y.
American Institute of Architects. Annual meeting. Executive Secretary, E. C. Kemper, The Octagon, Washington, D. C.

APRIL 20-25.—NEW YORK, N. Y.
National Conference on City Planning. International Town, City and Regional Planning Conference. Secretary, Flavel Shurtleff, 130 East 22nd Street, New York, N. Y.

APRIL 20-25.—NEW YORK, N. Y.
New York State Federation of Planning Boards. Annual meeting. Secretary-Treasurer, George Gove, 949 Broadway, New York, N. Y.

APRIL 22-24.—CINCINNATI, OHIO
American Society of Civil Engineers. Annual convention. Secretary, George T. Seabury, 33 West 39th Street, New York, N. Y.

APRIL 24-25.—ST. LOUIS, MO.
Missouri Commercial Secretaries' Association. Annual meeting. Secretary, Lawrence Jones, Chamber of Commerce, Independence, Mo.

APRIL 25-27.—LOUISVILLE, KY.
Conference of State Sanitary Engineers. Annual meeting. Corresponding Secretary, Arthur P. Miller, Assistant Sanitary Engineer, United States Public Health Service, Washington, D. C.

APRIL 27-MAY 2.—LOUISVILLE, KY.
American Water Works Association. Annual convention. Secretary, W. M. Niesley, 170 Broadway, New York, N. Y.

APRIL 28.—WASHINGTON, D. C.
American Civic Association. Pan American Conference on Capital Cities. Secretary, Miss Harlean James, Union Trust Building, Washington, D. C.

MAY 4-6.—MINERAL WELLS, TEX.
West Texas Chamber of Commerce. Annual convention. General Manager, P. A. Whaley, Stamford, Tex.

MAY 12-14.—CHICAGO, ILL.
National Fire Protection Association. Annual convention. Secretary, Franklin H. Wentworth, 40 Central Street, Boston, Mass.

MAY 12-16.—NEW YORK, N. Y.
International Police Conference. Annual convention. Secretary, Colonel R. Waldo, 240 Centre Street, New York, N. Y.

MAY 13-15.—CLEVELAND, OHIO
American Federation of Arts. Annual meeting. Secretary, Miss Leila Mechlin, 1741 New York Avenue, Washington, D. C.

MAY 13-15.—COLORADO SPRINGS, COLO.
Colorado Municipal League. Annual convention. Secretary, Don C. Sowers, University of Colorado, Boulder.

MAY 17-21.—ST. LOUIS, MO.
American Association of Museums. Annual meeting. Director, Charles R. Richards, 2 West 46th Street, New York, N. Y.

MAY 18-21.—MILWAUKEE, WIS.
American Society of Mechanical Engineers. Spring meeting. Secretary, Calvin W. Rice, 29 West 39th Street, New York, N. Y.

MAY 19-21.—CHICAGO, ILL.
National Firemen's Association of the United States. Annual convention. Secretary, Captain J. E. Mersch, 715 Monroe Street, Evanston, Ill.

MAY 19-21.—CHATTANOOGA, TENN.
Southeastern Water and Light Association. Annual convention. Secretary, W. F. Stieglitz, Columbia, S. C.

MAY 20-22.—WASHINGTON, D. C.
Chamber of Commerce of the United States of America. Annual meeting. Secretary, D. A. Skinner, 1615 H Street, N. W., Washington, D. C.

MAY 25-28.—MILWAUKEE, WIS.
National Association of Purchasing Agents. Annual convention. Secretary, W. L. Chandler, Woolworth Building, New York, N. Y.

MAY 25-28.—SKYLAND, VA.
National Conference on State Parks. Annual conference. Secretary, Beatrice M. Ward, 905 Union Trust Building, Washington, D. C.

MAY 25-28.—WASHINGTON, D. C.
Annual Conference on Weights and Measures. Secretary, F. S. Holbrook, Bureau of Standards, Washington, D. C.

MAY 28-30.—WASHINGTON, D. C.
National Conference on Outdoor Recreation. Annual meeting. Executive Secretary, Arthur C. Ringland, Room 2034, New Navy Building, Washington, D. C.

MAY 28-30.—MARTIN, TEX.
Texas Commercial Executives' Association. Annual meeting. Secretary, John Boswell, Plainview, Tex.

JUNE 2-4.—SYRACUSE, N. Y.
Conference of Mayors and Other City Officials of the State of New York. Annual meeting. Secretary, William P. Capes, 25 Washington Avenue, Albany, N. Y.

JUNE 2-5.—ORLANDO, FLA.
American Association of Engineers. Annual meeting. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

JUNE 7-9.—SHEBOYGAN, WIS.
Wisconsin Association of Commercial Secretaries. Annual meeting. Secretary-Treasurer, Lee I. Yorkson, Wausau, Wis.

JUNE 10-12.—ALEXANDRIA, MINN.
League of Minnesota Municipalities. Annual convention. Executive Secretary, Morris B. Lambie, The Municipal Reference Bureau, University of Minnesota, Minneapolis, Minn.

JUNE 10-17.—DENVER, COLO.
American Association for Community Organization. Annual meeting. Secretary, Pierce Williams, National Information Bureau, 215 Fourth Avenue, New York, N. Y.

JUNE 10-17.—DENVER, COLO.
National Conference of Social Work. Annual meeting. Secretary, William H. Parker, 25 East 9th Street, Cincinnati, Ohio.

JUNE 15-17.—BILOXI, MISS.
Southern Commercial Secretaries Association. Annual convention school. Secretary, Burke Hopgood, Chamber of Commerce, Durham, N. C.

JUNE 15-19.—SAN FRANCISCO, CALIF.
National Electric Light Association. Annual meeting. Executive Manager, M. H. Aylesworth, 29 West 39th Street, New York, N. Y.

JUNE 15-20.—MINNEAPOLIS, MINN.
National Tuberculosis Association. Annual meeting. Managing Director, Dr. Linsly R. Williams, 370 Seventh Avenue, New York, N. Y.

JUNE 23-25.—PITTSFIELD, MASS.
New England Association of Fire Chiefs. Annual convention. Secretary, Chief John W. O'Hearn, Watertown, Mass.

JUNE 23-26.—DETROIT, MICH.
National Association of Real Estate Boards. Annual convention. Executive Secretary, Herbert Nelson, 310 South Michigan Avenue, Chicago, Ill.

JUNE 22-26.—SARATOGA SPRINGS, N. Y.
American Institute of Electrical Engineers. Annual convention. Secretary, F. L. Hutchinson, 33 West 39th Street, New York, N. Y.

JUNE 22-26.—ATLANTIC CITY, N. J.
American Society for Testing Materials. Annual meeting. Secretary, C. L. Warwick, 1315 Spruce Street, Philadelphia, Pa.

JUNE 22-27.—LOS ANGELES, CALIF.
American Physical Education Association. Annual convention. Secretary, Dr. J. H. McCurdy, Box G, Highland Station, Springfield, Mass.

JUNE 22-28.—On board S. S. Richelieu, en route from Montreal, Que., to Charlottetown, P.E.I.
Union of Municipalities of the Province of Quebec. Annual convention. Secretary, R. Prieur, 326 Transportation Building, Montreal, Que.

JUNE 25-27.—TULSA, OKLA.
United States Junior Chamber of Commerce. Annual convention. Secretary, A. C. Keller, 603 Scripps Building, San Diego, Calif.

JUNE 28-JULY 3.—INDIANAPOLIS, IND.
National Education Association of the United States. Annual meeting. Secretary, J. W. Crabtree, 1201 Sixteenth Street, N. W., Washington, D. C.

SEPTEMBER 29-OCTOBER 2.—LOUISVILLE, KY.
International Association of Fire Engineers. Annual convention. Secretary, Chief James J. Mulcahey, Yonkers, N. Y.

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NEWARK NEW JERSEY

News and Illustrations

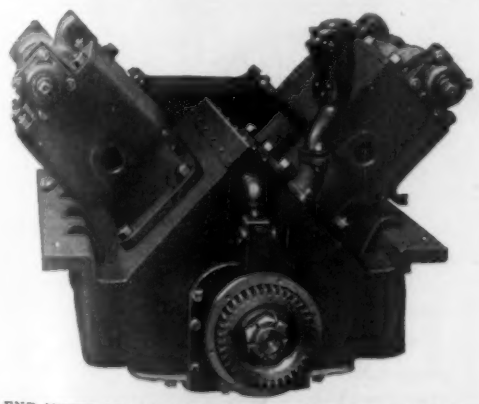
Items of Interest to City, Town and County Officials, and Others Interested in the Economical Construction and Efficient Operation of Public Improvement Undertakings

New Angle Type Portable Air Compressor

One of the machines which attracted particular attention at the Road Show in Chicago in January was the Sullivan 220-foot portable air compressor. This new machine, built in response to the increasing demand for portable compressors of larger capacity, by the Sullivan Machinery Company, 125 South Michigan Avenue, Chicago, Ill., embodies a number of interesting features.

The same size compressor cylinders have been utilized as in the 110-foot Sullivan portable machine, namely, 5½-inch diameter by a 5-inch stroke, single-acting, but there are four of these cylinders and instead of being arranged in a line vertically, they are set in pairs, each pair being at right angles with the other, forming a V; each pair is thus at an angle of 45 degrees from the vertical axis of the machine. The pairs of cylinders are slightly offset lengthwise, which permits operation from a single crank-shaft. There are only two crank-pins, but each pin accommodates two connecting rods side by side. The rods for the two forward cylinders are attached to one pin, and the rods for the two rear cylinders are connected to the other. Counterweights are provided on the crank-shaft, as in the case of the 110-foot unit, and the construction also follows that machine in providing a heavy square-rim fly-wheel at the rear end of the compressor inside the housing.

The 90-degree arrangement of the pairs of cylinders provides a counterbalancing effect similar to that which has proved so successful in angle compound compressors of the stationary type. This balancing secures a marked reduction in vibration. The 2-cylinder vertical 110-foot unit operates on its cast steel frame with markedly little perceptible vibration, but the 4-cylinder WK-314 angle or V-type compressor when mounted on the standard steel-wheeled truck of the trailer type rubber-tired truck, or on skids, runs as smoothly and with as little vibration as if bolted to a concrete base set in a permanent power-plant.



END VIEW OF COMPRESSOR, SHOWING ARRANGEMENT OF CYLINDERS

This compressor employs standard Sullivan Wafer valves, providing short lifts but wide port openings and high efficiency. All moving parts run in oil on the splash system. Pistons and connecting rods are of the automobile type. The compressor is direct-connected by means of an interlocking external and internal gear clutch to the Buda 4-cylinder, 4-cycle gasoline engine, which is standard power-plant for all Sullivan portable compressors. Forty-three horse-power is required to drive this compressor at its full rated speed of 800 r.p.m. The engine and compressor are firmly bolted to a substantial cast steel frame, yet the angle construction of the compressor and the consequent reduction of vibration have permitted holding the weight down to the very low figure of 5,360 pounds complete. This does not include oil, water and gas. The gas and air tanks are suspended in brackets at the compressor end of the rig, the air receiver being 20 x 60 inches in size and the fuel tank holding 25 U. S. gallons. The equipment includes standard Sullivan portable compressor fittings such as Racine radiator, Eiseman high-tension magneto with impulse starter, Zenith carburetor with Pierce speed governor, pilot valve or by-pass unloader, etc. The outfit is provided with hand-operated brakes on the rear wheels. The engine and compressor cylinder and the radiator are cooled by positive feed water circulation.

This compressor will operate two or three rock drills, three or four concrete breakers or tampers, and seven to nine riveters or clay spaders.

Thorne & Hostrup, Consulting Engineers

C. F. Hostrup, until recently Manager of Water Waste Surveys for the Pitometer Company, engineers, New York City, has joined with J. G. Thorne, of Clinton, Iowa, in the organization of Thorne and Hostrup, consulting engineers, 317 Howe Block, Clinton, Iowa. This new organization will specialize in the design and construction of municipal improvements and allied works.

New Heil Distributors in Cleveland and Louisville

The Heil Company, Milwaukee, Wis., has announced the appointment of the Gustav Schaefer Wagon Company, 4166 Lorain Avenue, Cleveland, Ohio, as distributors for Heil dump bodies, Hydro hoists and compartment tank trucks in the Cleveland territory. They have also announced the appointment of Sid. Schultze, 128 East Main Street, Louisville, Ky., as distributor in the Louisville territory.

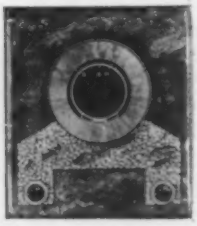
View of Dayton Business Section looking East on 3rd St. The 3rd St. Boiler Plant is at far end of picture.

Over 95 per cent of Building space heated by steam from mains in streets generated at 3rd St. Plant of the Dayton Power & Light Company.

View of Dayton Business Section looking south on Main St. Practically every building in this picture served by steam from the Central Boiler Plants of the Dayton Power & Light Company. There is at no time of the year any smoke and dirt from chimneys and stacks.

How would you enjoy living in a district where no smoke would be pouring from hundreds of stacks from individual heating plants; where no coal would be passing along the street; where no ashes need be collected; where no thought is given to buying fuel?

Such an ideal location is a community served with steam for heating and other purposes from a District Steam Heating Plant.



One of the types of mains through which millions of pounds of steam were delivered during 1924. Installed by the American District Steam Co.

An ADSCO installation crew installing underground steam mains under the supervision of experienced ADSCO engineers.

Such are the above business and residential sections of Dayton, Ohio, where District Steam Heating has for the past 20 years served hundreds of customers.

This service has gradually eliminated the smoke and ash nuisance and settled the individual's coal problem. It has kept the buildings warm throughout the winter; it has saved the city thousands of dollars by relieving the streets of the coal and ash traffic.

During 1924, Dayton's streets were relieved of the trucking of 15,970 five-ton truck loads of coal into the sections receiving steam through underground mains.

In over 400 cities in the United States and Canada District Steam Heating is bringing comfort into residence and business places.

There are several types of District Heating Companies:

1. The Company organized solely for the purpose of generating and selling steam.
2. The Electric Light Company. generating electricity with steam and selling the exhaust and surplus steam.
3. A Community Heating Plant for a group of residences.
4. A central plant for institutions, municipal buildings, hospitals, industrial plants.

You may be interested from a view point of having steam delivered to you or you may have an interest in the operation of a District Steam Heating Plant; if so, tell us and we shall gladly show you how to analyze the opportunities of District Steam Heating.

Ask for Bulletin No. 20-AC-1—District Steam Heating started in Lockport, N. Y. in 1877.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

OFFICES:

NEW YORK CHICAGO SEATTLE

ADSCO HEATING

When writing to Advertisers please mention THE AMERICAN CITY—Thank you.

LINN TRACTOR HAULING RUSSELL GRADERS

Heavy-Duty Tractor Carries Its Load as Well as Hauls Trailers

The general design of the Linn tractor, with its long-frame track-laying drive in the rear, and steerage in front, gives certain advantages. The mechanism of this outfit, which is made by the Linn Manufacturing Corporation, Morris, N. Y., is simplified to the extent of doing away with steering clutches, steering brakes, and their controls, making it possible to apply full power on sharp turns. Both tracks drive around a turn, preventing the cutting up of the surface of the ground. This tractor, according to the manufacturers, will easily turn inside a 35-foot circle.

Steering is done with an ordinary steering wheel as in a truck, a further simplification which eliminates track-steering pedals and levers. It is safe because it operates the same way under all circumstances.

In most tractors as the pull increases, the front of the machine tends to lift up. The Linn track is held to a full length bearing with the ground under severe conditions of pull, because the weight of its front end is so far ahead of the driving sprocket. The traction necessary in pulling heavy loads is thereby maintained, a distinct advantage in heavy haulage.

The outstanding features of the new traction member are, a rear drive of great flexibility; a mechanism which automatically compensates for unevenness in the ground, relieves the jams of ice, rock or dirt between the sprockets and the tracks and takes up wear; the support of the machine so that no weight is carried on any axle, and the use of manganese steel in every part subject to abrasive wear.

This tractor has a large body capable of handling any kind of material which a city or contractor may desire to haul. Furthermore, it can haul a train of trailers and thereby increase its effectiveness. It is not unusual for a tractor with trailers to handle a total of 13 yards of gravel moving the entire train over soft ground before reaching a paved road.

Another feature of the Linn tractor is its adaptability to snow removal work, where it can handle the largest size V-type snow plows as well as wings, thus making it possible to open up unusually wide paths for traffic in one trip.

LINN TRACTOR WITH CHAMPION SNOW-PLOW CONQUERING SNOW-DRIFTS

Mathieson Alkali Moves New York Offices

The Mathieson Alkali Works, Inc., has announced the removal of its general offices from 25 West 43rd Street to 250 Park Avenue at 46th Street, New York City. The new offices are larger and provide better facilities for the efficient handling of the company's expanding business.

New Paradon Sales Offices

The Paradon Engineering Company, 24 South Washington Place, Long Island City, N. Y., has announced the appointment of the Water Works Supply Company, San Francisco and Los Angeles, as Pacific Coast representatives for the sale of its chlorinating apparatus for sanitary and industrial uses. The General Supply Company of Canada, Ltd., Ottawa, Montreal and Toronto, have been appointed Canadian representatives. George E. Gilbert, formerly of Wallace & Tiernan Company, has joined the Paradon Engineering Company. Charles T. MacFarland, Mutual Building, Kansas City, Mo., has been appointed Middle Western representative, and Lawrence K. Cecil, 816 Colcord Building, Oklahoma City, Okla., has been appointed Southwestern representative.

A Truck-mounted Tank-Car Heater

A truck-mounted tank-car heater consisting of specially designed equipment that has been completely tested under actual conditions and that will heat tank cars of 10,000 gallons capacity filled with heavy bituminous material to 350 or 400 degrees Fahrenheit in 6 hours and empty the whole car at a pumping temperature in 10 hours, has been manufactured by Chase & Lyman, Inc., 12 Pearl Street, Boston, Mass.

The equipment of this outfit consists of a specially designed boiler operating at 125 pounds steam pressure on the heating coils in the tank car, so that only four to six hours should be required to melt the greater part of the material in the tank-car. The exhaust steam from the heating coil is returned to the water storage con-

Non-Skid Hi-Type

Maximum Cushion and Traction for Big Trucks

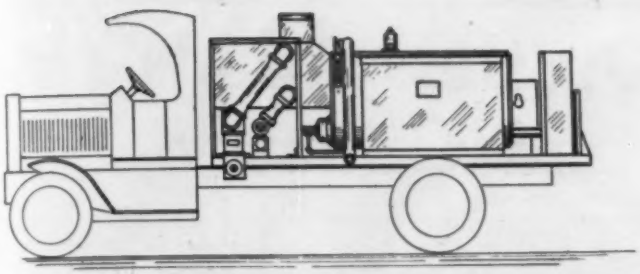
Heavy trucks need extra cushion to protect engine from road pounding—and extra traction to give sure grip on slippery streets and hard going.

Firestone Non-Skid Hi-Type meets these needs. It is correctly balanced to hold up in heavy haulage. The rugged tread gives firm foothold under the worst conditions. And note its unusual depth.

800 Firestone Truck Tire Service Dealers—located in every trucking center—are truck haulage experts. Let them show you how to reduce your operating costs.

Firestone

MOST MILES PER DOLLAR



OUTLINE SKETCH OF NEW TRUCK-MOUNTED TANK-CAR HEATER

denser and pumped to the boiler by an automatically controlled feed-water pump. As soon as some of the material in the tank-car is liquefied, it is pumped from the tank-car through the booster and returned to the tank-car. This raises the temperature of the material very quickly, agitating the material and thus greatly increasing the rate of heating the tank-car. The booster is also used to heat distributing trucks by pumping through the superheater to the truck. By this process the distributing trucks may start on the penetration work in about six hours from the start of heating the tank-car and continue at short intervals until the tank-car is empty. Thus the entire tank-car can be handled at any desired temperature between 300 and 400 degrees Fahrenheit within 10 to 15 hours.

The C. & L. tank-car heater consists of one C. & L. boiler with special clean-out, one bituminous superheater, one oil-burning outfit complete with burners and storage tanks, a steam-jacketed circulating pump, an air-compressor, a gasoline engine, an automatic feed-water pump, a storage and condenser tank, a special steam trap and flexible hose connections for steam and bituminous materials. All of this equipment, including fixtures, valves, piping and insulations, is mounted on a steel frame constructed to readily bolt to any truck of 2½ tons or greater capacity. The weight of the equipment itself is approximately 2½ tons.

The boiler measures 35 inches inside diameter by 66 inches between heads and will develop over 40 horse-power.

Special Train to American Water Works Convention

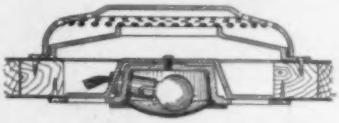
A special train on the Pennsylvania Railroad has been arranged by the Chairman of the Transportation Committee of the Water Works Manufacturers' Association, Walter H. Van Winkle, Suite 1951, 50 Church Street, New York City, for members of the American Water Works Association and their guests leaving from the East. This all-Pullman train will be a special section of Pennsylvania Railroad Train 27 and will be operated from the Pennsylvania Station, New York City, through to Louisville, Ky., leaving New York at 10:05 A. M. Sunday, April 26, Eastern Standard Time, arriving at Harrisburg 2:38 P. M., Pittsburgh, Pa., 8:34 P. M., Cincinnati, Monday, April 27, 6:30 A. M. Central Time, and Louisville, Ky., 10.30 A. M.

Reservations on this train should be made direct to Mr. Van Winkle. Parties desiring to leave from other points to Louisville will kindly communicate with the member of the Transportation Committee covering his district: W. E. Cox, Neptune Meter Company, Chicago, Ill.; T. C. Clifford, Pittsburgh Meter Company, East Pittsburgh, Pa.; Joseph Ivy, American Cast Iron Pipe Company, Kansas City, Mo.; H. M. Lofton, Columbian Iron Works, Chattanooga, Tenn.; Walter Chellew, Buffalo Meter Company, Buffalo, N. Y.; Stephen H. Taylor, Superintendent, Water Department, New Bedford, Mass.

The fare one way from Boston is $37.94; from New York City, $31.32; and from Philadelphia, $28.08. The Transportation Committee will provide the return fare certificates, allowing half-fare on return if 250 are issued, for those going on the special train.

Ventilation for Busses and Cars

The importance of ventilation for closed bodies is so essential that it should be given particular attention by municipal officials in charge of the operation of busses and other closed cars which



CROSS-SECTION OF VENTILATOR

VIEW OF VENTILATOR LOOKING DOWN ON IT

are constantly in operation. Common sense dictates that there shall be a continuous change of air in any compartment, exhausting the vitiated air without exposure to uncomfortable drafts, to which most people are easily susceptible.

The N-L type AA bus ventilator made by the Nichols-Lintern Company, 7960 Lorain Avenue, Cleveland, Ohio, is made of Armco galvanized sheet iron and weighs 3½ pounds. Either regulative or non-regulative polished aluminum inside grills may be secured. The N-L aerating ventilator, illustrated, is made entirely of cast aluminum. This ventilator operates continuously, regardless of weather conditions and without discomfort to the occupants, providing pure, clean air and exhausting engine fumes, stuffy air and tobacco smoke quickly. It also provides adequate protection against rain, dust, sleet and snow, none of which can enter the car, as is the case when a side window is opened.

Diven with Leadite

J. M. Diven, Jr., formerly with the Kelly Well Company, Grand Island, Nebr., has joined the sales organization of the Leadite Company, according to George McKay, Jr., President of the Leadite Company, Philadelphia, Pa.

Beautiful Dustless Roads In Town and Country

Lays the dust without inconvenience to pedestrians. No tracking, no staining. Ordinary laborers with hand shovels or the special Solvay spreader do the work quickly at little cost.

Solvay binds the surface and lays the dust. Its chemical properties kill weeds.

SOLVAY

Flake
CALCIUM CHLORIDE

"The Natural Dust Layer"

Solvay Flake Calcium Chloride is a clean, odorless, white, flakey chemical which lays the dust and is a perfect surface road binder. Solvay keeps roads in wonderful condition. It is the perfect material for town and country road treatment. Will not run hills nor form puddles in hollows. Economical in use and application—efficient in action.

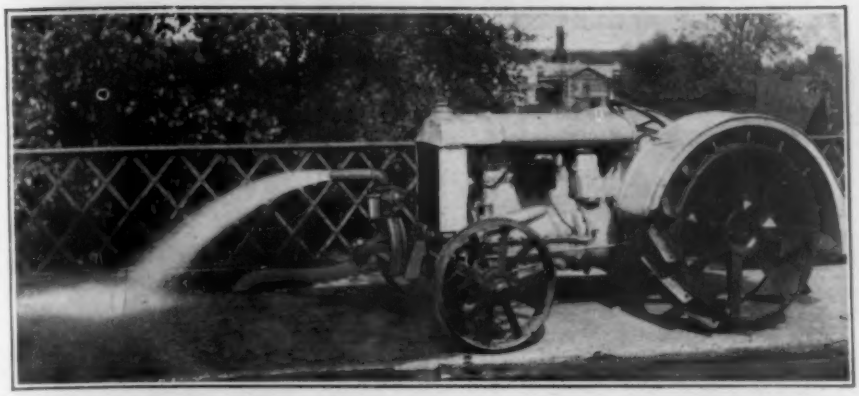
Seventy-five conveniently situated distributing points assure prompt delivery and minimum transportation charges.

Write for Booklet No. 1002.

THE SOLVAY PROCESS COMPANY

Wing & Evans, Inc., *Sales Department*, 40 Rector Street, New York

Chicago Cincinnati Pittsburgh Cleveland Detroit Boston Indianapolis Syracuse



BARTON PUMP ATTACHED TO FRONT OF FORDSON TRACTOR

A Portable Pumper Mounted on Fordson Tractors

A practical portable pumping outfit which may be quickly attached to the front of a Fordson tractor and which places no strain or overload on the crankshaft, has been devised by the American Steam Pump Company, Battle Creek, Mich., and is known as the Barton portable pumper. This dependable pump is a centrifugal type of special design, and of minimum weight, yet strong enough to stand the strain of overload. As the weight of the pump is carried on the frame of the car or tractor it may be left on while driving without strain or breakage. The pump is driven by means of a floating shaft from the motor and is made in two standard sizes, 2½- and 3-inch. The suction hose used on the 2½-inch pump is a 3-inch hose, and on the 3-inch size, 3½-inch hose, both of standard thread. The 2½-inch pump will lift water over 20 feet and has a normal discharge capacity of from 200 to 250 gallons per minute at 18 miles per hour driving speed. The 3-inch pump has a discharge of 300 gallons or more per minute. A small hand clutch is used to disengage power units while driving.

A New Sanitary Garbage Wagon

At the Los Angeles, Calif., motor show held recently, one of the new features was a Moreland drop-frame chassis provided with a new type of closed garbage body, made by the Moreland Motor Truck Company, Los Angeles, Calif. By means of this new body, which is here illustrated, it is claimed that garbage can be collected and transported in one-half the time now required for this work. Because of the low chassis, the men can easily empty garbage cans into it when standing on the ground. The provision of keeping the garbage in a closed body is a sanitary measure, as it prevents the odors from being noticed on the streets through which the garbage trucks travel.

Pneumatic tires and a powerful engine make this truck speedy and practically noiseless in operation. It has created a great deal of interest among the boards of health in western cities.

Patent Issued to Dow Chemical Company

The Dow Chemical Company, Midland, Mich., has announced that on February 17, 1925, Patent 1,527,121 was issued to it covering a process of manufacturing metallic chloride products under a new patent. The patent broadly covers the form of calcium chloride which the Dow Chemical Company has marketed for a number of years for use in highway work.

This form of calcium chloride, known as Flake calcium chloride, is used widely for dust prevention on gravel and stone roads, as well as for curing concrete, its main property being the absorption and retention of a volume of moisture sufficient to cure concrete without earth or straw covering or ponding and without need for pipe lines and water pumping. The same moisture-absorbing property is said to be the reason for its use to maintain gravel and stone surfaces in a firm, moist and dustless condition, with only two treatments annually.

The calcium chloride covered by the new patent is a non-caking flake which the new process renders suitable for packing in bags and for shipping and storing in that form without caking, since it is superficially dehydrated to the point where the tendency to cake in the package is reduced. The flake-like particles are superficially dried and a portion of the water of crystallization is also removed.

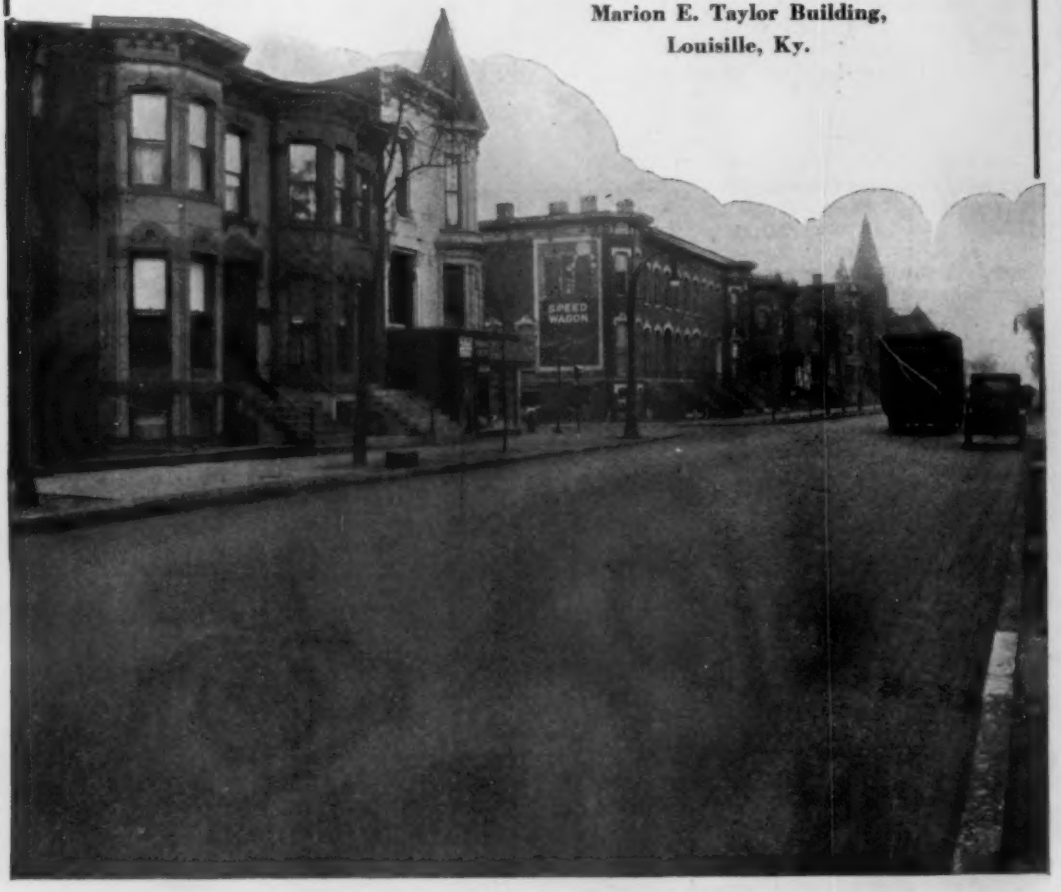
A GARBAGE COLLECTION TRUCK WITH COVER AND LOW MOUNTED BODY

Re-Surface with Kyrock and Save One-Half

Hundreds of miles of Kyrock re-surface, on old macadam, gravel, brick and asphalt, have been giving service equal to complete new pavements, over a long period of years.

Kyrock surfacing is the most practical and economical because of its long life and simplicity of construction. It is a natural product shipped ready to lay cold, on any standard type of base. Below is shown a section of Washington Blvd., Chicago—old macadam surfaced with Kyrock and subject to very heavy traffic. Literature on new construction, re-surfacing and patching will be sent on request. Ask for Booklet A. C.

Kentucky Rock Asphalt Company

Incorporated

Marion E. Taylor Building,
Louisille, Ky.